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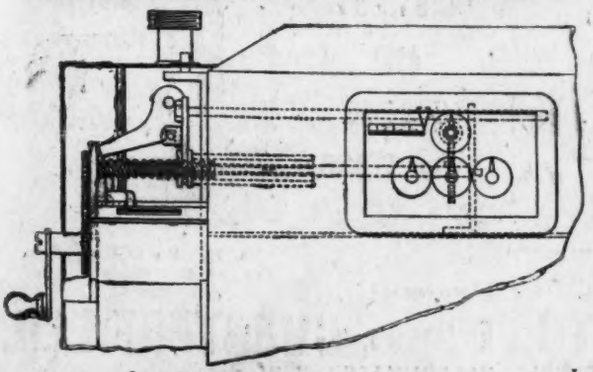

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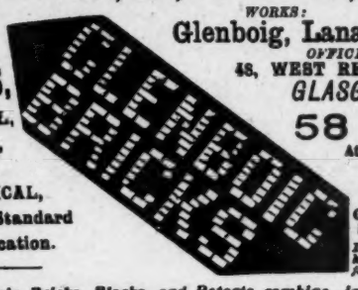

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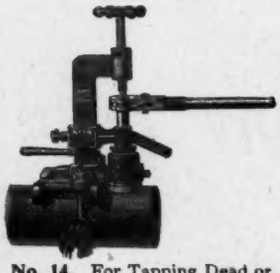

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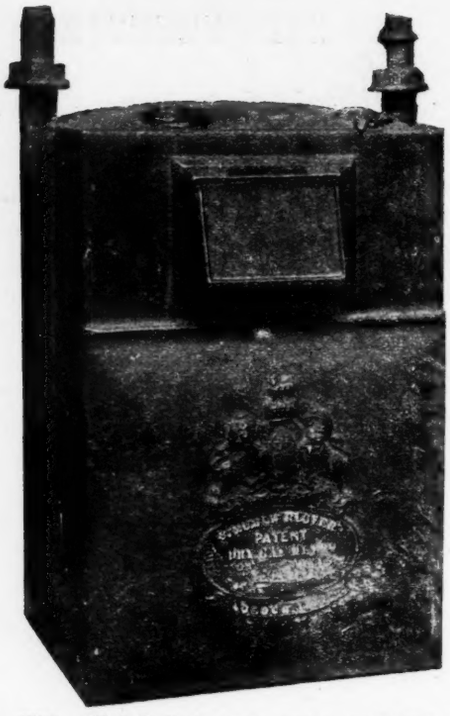

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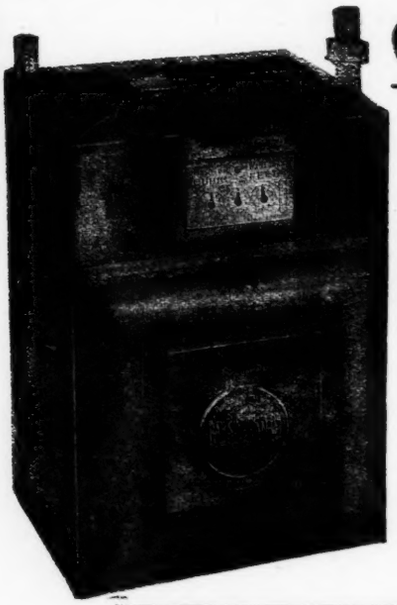

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXLIV., No. 2892.] TUESDAY, OCTOBER 15, 1918. [70TH YEAR.

EDITORIAL NOTES.

The Reconstitution of the National Gas Council.

NEWS which reached us from various quarters during last week declared that the scheme which was submitted through our columns a week ago for the reconstitution of the National Gas Council is being well received throughout the country; and it appears to be generally regarded as about the best conception of complete representative organization that has yet been constructed or suggested to deal with matters of general gas policy. The most attractive features are those which put into the structure representation territorially and of all responsible interests of the gas supply industry, which together ensure a consolidation in the central body that has never before been attempted, much less achieved, while the voting powers defend interests in point of magnitude, and at the same time guarantee power to prevent any extremist views or a weak-kneed policy gaining supremacy. For years the "JOURNAL" has advocated a closer alliance with the political work of the industry of those who hold administrative and fiduciary positions in gas undertakings, and who are directly responsible to shareholders and consumers. The scheme does not go the full length of what we have had in view; but it is a development that clearly has within it the greatest potentialities, and through it the aspirations of those who would go further may in time be fulfilled. It is perhaps the wiser course to get first a central organization that has within itself all the qualities necessary for, when the time is ripe, undertaking a more ambitious scheme.

The Institution of Gas Engineers will be considering on Thursday the plan for the reformation of the Council; and we feel confident that its soundness will commend it to them as a practical solution of a problem that it has been manifest required handling in a firm and masterly manner, as it now has been. We recognize that the Institution, when the National Gas Council was first formed, gave up something in the way of supremacy. But what they relinquished was only the work for which, while possessing the qualification of brains, they lacked the qualifications of power, authority, and influence, and of direct responsibility for the financial and administrative interests of the undertakings they represent. This was acknowledged by their adhesion to, and partnership in, the existing National Gas Council. They therefore cannot take up an antagonistic attitude to an improved national body, but must, in the interests of the entire industry—and such interests are paramount beyond any question—give to it their undivided support. We may be sure that, under the leadership of their President (Mr. Samuel Glover), this will be the result of the deliberation on Thursday. There may be suggestions—it is not too late—that can be offered for the further improvement of the scheme; but so far we have not learned of any. From one quarter we hear that there is some fear that the scheme may affect the work of the Commercial or General Purposes Sections of the District Associations of Gas Engineers and Managers. We fail to see in what way. There are others, too, who think that the separation of municipal undertakings from company undertakings would be a good thing. Those who are so persuaded are in a splendid minority; and since the sketch of the scheme was published, with discussion of the point in these columns, there have been some secessions from their already short and thin ranks. The powers of the reconstituted Council should be, if they are not already, expansive enough to permit of the formation of Special Committees to consider questions that are peculiar only to company undertakings or to municipal undertakings. Now is the time to make the machinery of the National Gas Council within the scope of what is proposed as complete and comprehensive as possible. However, the satisfactory thing is that the reconstruction plan is receiving such hearty support as an excellent piece of constructive work for the industry. Peace draws nearer; and the prospect of it should spur on the industry to put, at the earliest possible moment, its central organization into order in regard to representation and authority, for there is much to be done, and no time to lose.

The Ten Years' Tar Bond.

THE tar meetings in provincial centres and in London have all been held, and, on the whole, there has been pronouncement in favour of the scheme which, after considerable negotiation, as well as delay in the proximity of many pitfalls, has been arranged by a Joint Committee of representatives of the gas industry and the tar distillers. It now requires final ratification; but whether this will be realized depends upon the weight of opinion on the side of gas undertakings which there has been no complete opportunity of ascertaining. The difficulty there has been in arriving at a settlement is not astonishing, as history has put on record that tar distillers, with limited exception, have known how to drive a hard bargain; and there is knowledge that in the present scheme the distillers and not the producers are responsible for the long-term agreement of ten years in which they shall have pre-emption in the matter of the tar of those undertakings that determine upon acceptance. Against the principle of the scheme, there can be no great objection. It certainly assures something better for the producers than many of the distillers cared to part with in the past; it also provides for sharing, without at present establishing a basis (which could not yet be established), in the value of any developments that may take place through subsequent discovery. But, why if the scheme is one which holds the balance equitably between producer and purchaser, were the distillers so inflexible over the matter of the first contracts being for such a long span as ten years? This stipulation is partly responsible for the warning that Mr. H. E. Jones made in our "Correspondence" columns last week. The distillers by their insistence on the long period confess to a fear of something happening if they do not bind sellers for a considerable time ahead, and so prevent them making an alternative move. If the scale of percentages is satisfactory to purchasers and sellers alike, then there should be in them alone sufficient inducement to obviate the necessity either for ten-year agreements or for any contemplation of an alternative move. Besides, the possession of distilling plants and all the attendant organization should put the distillers into such a strong position that, given fair terms as between purchaser and seller, other projects such as there have been in mind would be put outside the pale of practicability.

It would be well to ascertain the exact reason for the ten years' contract, because this condition does not comfortably square with the suggestion made by Mr. H. C. Head in our "Correspondence" columns to-day, that it would be very uneconomical from the national point of view, at any time during the next decade at least, to establish new works, while plants remain in existence capable of distilling the whole of the tar produced. There is something faulty about this submission; and it is a little assertive in respect of the "next decade at least." Did it not occur to Mr. Head when inditing his reply to Mr. Jones, that, if the distillers know their business, at the end of ten years there will still be

plants in existence capable of distilling the whole of the tar then produced? Therefore, his argument would, if accepted now, hold good indefinitely; and there would never be any opportunity for the industry, if it so wills, to enter into tar distillation on co-operative lines among its own undertakings. To accept Mr. Head's argument would be to throw up now and for ever more all idea of ever combining to deal with one of our own products, no matter what happens. We do not forget Plymouth. There it was a gas undertaking that bought up the whole "box of tricks" of a firm of distillers, without starting a new distillery. We are not, however, aware that there are, even under the scheme, any other distillers anxious or willing to get rid of their plants. On the contrary, they wish to tie-up gas undertakings on the agreed terms for ten years to produce and supply them with tar. There is the evidence of a deeply-rooted desire to remain in the business. But why their fears, as indicated by the ten years' agreement?

The Latest Increase of Wages.

The gas industry is having more than its full share of war increases in labour wages, inasmuch as before the war it was not at all a bad paymaster to the men, who, in major part, also received valuable considerations other than those of wages. Just recently, close on top of the general award of the Committee of Production, came a fresh demand for an advance of 10s. a week for men and women over eighteen years of age, and of 5s. for youths. The position of the industry is such that it cannot afford such arbitrary demands, which, so far as allowed or agreed to, have all to fall back on the consumers, a large proportion of whom are working folk, and not a negligible part are far from being in such affluent circumstances as gas workers. Conference has, in this instance, proved a success. The representatives of the gas employees and of the gas industry met and discussed the position; and both parties are to be congratulated on letting reason rule. The settlement provides for an advance of 3s. 6d. per week for men and women, and half this amount for all youths. According to Col. Will Thorne, M.P., it includes at least 100,000 persons. His estimate is that gas workers, as a rule, are at the present time getting 23s. 6d. a week, *plus* the 12½ p.ct. war bonus, above their pre-war rates of wages. If the 100,000 persons referred to are all getting 23s. 6d. extra per week, this would mean an annual addition to the wages bill of the aggregate of the gas undertakings employing that number of upwards of £6,000,000; and probably the 12½ p.ct. on the total wages would mean somewhere about a further £2,000,000 per annum. This £8,000,000 is only one direction in which heavy war costs have fallen upon the industry; and yet we hear of a Board of Guardians in South London crying out against the increased cost of gas! How gas undertakings could exist at all if some people had their way, may be left to their explanation. We confess that, if they had their way, the means of continuing existence is not apparent to us; what would actually happen is abundantly clear.

A Survey of Unaccounted-for Gas.

A valuable article on an investigation of unaccounted-for gas appears in this issue by Mr. Stephen Lacey, B.Sc.(Eng.) London, the Distributing Engineer of the Gas Light and Coke Company; and it should be read as a prelude to the contributions which will be made by Messrs. B. R. Parkinson and J. G. Taplay, at this week's meeting of the Institution of Gas Engineers. It is a subject that in writings and practice has hitherto been dealt with in a more or less haphazard manner; and it is full time that it was seriously tackled. Although the survey which Mr. Lacey has made, in order to determine the relative importance of the different factors that go to make up the total of unaccounted-for gas (under the conditions of the Gas Light and Coke Company), embodies certain conjecture on which calculation is made, it is a carefully executed piece of work which in itself appeals, without any direct expression on the part of the author, for a deliberate investigation to secure a basis upon which surveys of unaccounted-for gas can be made, to allow each undertaking to determine with a fair measure of exactitude the source of the major part of unaccounted-for gas, and to enable comparison to be instituted as between one undertaking and another. The latter it is impossible to do in present circumstances; for no one, except the calculators of the percentages which are now presented as representing unaccounted-for gas, knows the constituents of the basis adopted in arriving at them. For example, at the very base of calculation, there is the registration of the station meters. In some cases simple registration is accepted as the gas made, without any correction; in other cases, the registration of the station meter is corrected to conditions as regards temperature and pressure assumed to bring it to the same conditions of measurement as gas sold; in other cases registration of the station meter is corrected to standard temperature and pressure; while, as in the case of the Gas Light and Coke Company, a compromise is taken between the second and third named practices. There is something to be said (as Mr. Lacey points out) in favour respectively of all these plans, except the first; but what is wanted is to agree upon a common practice, in doing which necessarily some advantage of one method over another will have to be abandoned. Again, at the other end of the distribution system, one gets into a quandary as to the figure to adopt as a fair average of the temperature at which the gas sold is registered. The figure must be more or less arbitrary; seeing that the location of meters has a disturbing effect, and the introduction of prepayment meters (which, as a rule, have better protection in respect of temperature) have come in to upset any previous conclusion that may have been formed in this respect. Mr. Lacey in his survey has used the figure adopted by the South Metropolitan Gas Company, of 5° above shade temperature, as a fair average of temperature of registration of gas sold. As the results of the investigation disclose that registration has a large share in the total of unaccounted-for gas, we see how important it is that some decided basis of procedure should be adopted throughout the industry in regard to the temperature of registration of both gas made and gas sold.

It is, of course, necessary to bear in mind that "leakage" and "unaccounted-for gas" are not synonymous terms. Every gas engineer appreciates this; but there is slipshod use of the expressions. In making a survey to find the relative importance of the factors contributing to unaccounted-for gas, it is necessary to have a definite line of research in three different directions. Mr. Lacey makes a good distinction between them thus: (1) The part which results from the difference in conditions of measurement (as regards temperature, pressure, and degree of saturation with aqueous vapour) of "gas made" on the one hand and of "gas sold" on the other. (2) The part due to leakage from the plant (gasholders, mains, and services) between the station meters and the consumers' meters. (3) The part due to errors of registration, either in the measurement of "gas made" or of "gas sold." Then he informs his readers as to the lines that he has taken in estimating as correctly as may be the value of the first two; and the value of the last part due to the errors of registration is shown by the difference found between the sum of Nos. 1 and 2 and the total of the unaccounted-for gas. Under the conditions obtaining in the Gas Light and Coke Company, he arrives at the conclusion that the differences in condition of measurement of gas made and gas sold is responsible for an average in the neighbourhood of 1 p.ct., and that the part due to leakage of gas from the holders, mains, and services does not exceed 1 p.ct. of the quantity made. Therefore errors in registration must be responsible for a considerable share of the unaccounted-for gas; and this share may, in turn, show substantial differences through conditions peculiar to any one year which may affect the registration of consumers' meters. But, of course, while this survey is excellent in the guidance it affords for similar investigations, it is perfectly clear that the deductions from it—anyway in respect of leakage—cannot be wholly applied to other districts where there are not concrete foundations and paved surfaces as in the Metropolitan area, and which conditions very greatly neutralize effects experienced elsewhere. Mr. Lacey acknowledges this when he says there is good ground for the conclusion that leakage from the mains and services in a city such as London varies little from year to year. The conditions of the subsoil, the position of the mains and services, and the character of the traffic (to say nothing as to the underground workings) do in some areas cause leakage to be the predominant factor in the unaccounted-for gas.

It is a good piece of work that is presented to the industry in the article, as it opens up the road to the defining of a systematic method of assessing unaccounted-for gas with more truth, and ascertaining the relative importance of the contributors to the total.

The Outlook and Necessary Action.

The outlook of the gas industry is very extensive; but it greatly depends upon the manner in which the universal affairs of the industry are handled to-day—whether circumspectly, steadfastly, and with the direct intention of achieving the maximum advantage for the industry and country, or the contrary—whether the outlook progressively materializes, or becomes contracted. We hope the reformation of the National Gas Council will be speedily accomplished, so that the central and dominant organization of the industry may energetically take matters in hand with a complete authority for which, through the character of its constitution, the present Council has not been particularly distinguished. But the interests of the industry must not be allowed to suffer while the reorganization of the Council is proceeding; for now and not later is the time to act. The greatness of the industry's outlook and opportunities, and the insistent need for action constitute the main vein of thought running through the Presidential Address of Mr. Reginald G. Clarry, of Swansea, to the Wales and Monmouthshire District Institution of Gas Engineers and Managers. The whole address bulges with the war work, developments, and prospects of the industry, with incidental references to the poverty of the requital that has been made for its national service, and to the obligation that rests upon those in authority to obtain for the industry proper recognition and liberty through Government assistance and legislation consistent with changed circumstance and service.

This is a matter that has impressed itself on Mr. Clarry for some time; and we believe it was through his ardent views in this direction that the Special Purposes Section of the Welsh Institution passed a resolution pointing out to the National Gas Council that, in consequence of the phenomenal developments brought about by the war, it was obvious that numerous drastic reforms are immediately imperative in matters appertaining to the industry, and strongly appealing to them to urge the President of the Board of Trade to at once appoint an independent Committee to make an inquiry, and recommend to the Board of Trade a definite and comprehensive policy to secure the stability of gas undertakings, and to utilize fully the gas industry as a national asset, and so maintain for gas consumers the maximum efficiency of service. An inquiry of the kind by men of eminent position, authority, and influence, and a plain presentment by them in a report on the necessities of the industry, we regard as vital to it, and not only in view of what is being done elsewhere for and in the electrical industry (which must affect our own unless we can put the prosecution of its interests on terms of fair equality), but so that the Government may be persuaded, in the best possible and independent manner, of the need for divesting the industry of what Mr. Clarry describes as obstructing "precedent" and antiquated legislation." A case so presented will have more effective and constructive value than all the arguments of Counsel before a Committee of Members of Parliament who could not thoroughly appreciate (a recent occasion very sharply brought home the fact) such a large question as this, nor see its importance to the country, as they would be able to do with everything before them in measured terms and proper proportion and relation. The industry has too long suffered itself to be the victim of inappreciation and misrepresentation; and the fault is partly—perhaps it would not be too much to say, largely—its own. It is Mr. Clarry's opinion that conditions should be established to secure the permanent stability of gas undertakings, utilize fully the gas industry as a national asset, maintain for gas consumers the maximum efficiency of gas service, and generally allow gas undertakings more scope to develop on commercial lines. It is time the industry pressed a little more urgently for the advocated Special Committee of influential composition.

In business in the staple and secondary products, the outlook for the industry is excellent, subject to the fact that in gas for heating and sulphate of ammonia for agriculture competition is going to be keener than in the past. We have no fear regarding gas. Mr. Clarry alluded separately to the outlook for the industry's productions, and to the excellent fields there are for enterprise in every direction in which these productions can penetrate. We cannot touch in this article upon all that he had to say in these connections; but there are points that have association in the questions of benzol extraction and blue water gas utilization. In the President's opinion, the process of recovering benzol and toluol has come to stay in the gas industry. He describes it as the "salvage" of what was formerly waste. That is a very good description; and we firmly believe that benzol extraction has become, under the new conditions, a permanent part of the operations and trading of the industry. But there is another aspect of the question; and it is one that especially concerns gas undertakings using the poorer grade of gas-making coals—such as those from South Wales. On more than one occasion, Mr. Clarry has been able to prove that straight coal gas of 10,500 c.ft. per ton (South Wales coal) of 500 B.Th.U. gross is more costly to produce than richer coal gas at a much lower make per ton, to which can be added blue water gas—the mixture likewise possessing a calorific value of 500 B.Th.U., but a higher flame temperature than the straight coal gas, and so of greater value to the consumers. Now elsewhere it is seen that at Swansea, on a basis of 65 p.ct. crude benzol at 120° C., 0·58 gallon of crude benzol is being obtained, using South Wales coal. In view of this, and of the quality of the coal, it might be worth consideration whether there would not be more profit in leaving the benzol in the gas, and thus enabling the addition of somewhat more blue water gas, than in extracting the benzol. It is all a question of which would be the more profitable—the sale of the small quantity of benzol per ton of coal, or the sale of the additional gas. With, too, a poor class gas-making coal (such as that of South Wales), the coke would derive some advantage from carbonization at lower temperatures to secure a richer gas for utilization with blue water gas. This is a point that should be borne in mind as a factor in the commercial situation of a gas undertaking. We think that, since the inert gas disclosures, several gas engineers who were not so careful in this respect as the President, have been less keen on large gas makes per ton of coal, and have adopted dilution in preference, and found more profit in it both for their undertakings and for consumers, with a clearer conscience so far as the latter are concerned.

The day is past for looseness in dealing with the affairs of the gas industry. Things have been allowed to slide too much. Nevertheless, the industry has made tremendous progress; but this has been more through the good fortune of possessing commodities that were required, and through the application of commercial ability, than through the controlling conditions being conducive to progress. Measure the pre-war advance of the industry with what we now know as to its capabilities, and it is seen that the former progress falls very far short of what it might have been under suitable conditions. The gas industry has been forced to remove the scales from its eyes. Now that things are seen in their true light, let there be a pressing forward in the right directions to a fuller life.

Gas Leakage and Coal Saving.

In these days when coal economy is of the utmost importance, it is a thousand pities more men cannot be spared to carry out the systematic testing and rectification where necessary of the distribution systems of some gas undertakings we have in mind, and in connection with which, during the war period, the unaccounted-for gas has risen in a most remarkable manner. To some extent, doubtless, this is due, in certain cases, to the heavy traffic from and to munition works, as well as to the higher pressures that have been necessitated to adequately supply these works, and to maintain the normal supplies *en route*. The impossibility, too, of sustaining the standard of district inspection is also in part responsible for the increased loss. If the excess above normal leakage from mains and services that there is to-day in the United Kingdom could be saved (we are not discussing other matters here which contribute to the unaccounted-for gas item, these being dealt with in a preceding article), it would much gladden the heart of the Coal Controller, if he only saw what it meant in the aggregate in coal. However, one cannot do more than is possible; but that much should be done. The paper that Mr. Frederick Shewring read at the Welsh Institution Meeting last week, though it was not intended as a war-time paper, but one pointing a general moral, has an appropriateness both in this connection as also permanently. Of course, local conditions in regard to the district, the character of the soil and of the traffic, the condition in regard to the depth of the mains, and a number of other circumstances all affect the question of unaccounted-for gas in a district; and nothing but systematic treatment can ensure a low level of leakage. Gas engineers have different views as to

the best means of making a systematic survey; but the differences are largely in detail. Mr. Shewring describes what he considers to be the best method of procedure; and there may not be acceptance of it in all respects. But whether or not this be so, the proof of efficiency is in the result. And Mr. Shewring gives a striking illustration (one of several which he could have adduced) of the testing of one section of main, which resulted in the saving of nearly a quarter of a million cubic feet of gas per annum. This is a sufficient recommendation of the advocated periodical examination and testing of mains and services. There are some districts that have alarming double figures representing the percentage of unaccounted-for gas; and if these percentages could be reduced, it would make a vast difference in the financial condition of the concerns, as well as in the price of gas, and would consequently attract a larger business. Moreover, now and henceforth coal economy as a matter of national importance will become more insistent; and savings in distribution losses react not only upon the quantity of coal that has to be carbonized but handled, as well as on labour, fuel, condensation, purification, storage, and wear and tear—in fact, all through the gas-works system and processes saving of leakage means enhanced efficiency. Therefore, it is a duty the industry owes not only to itself but to the nation to do all within its power to conserve coal, both directly through improved carbonization, and through the distribution system by adopting the methodical testing and rectification of discovered faults.

Calorific Power in Canada.

There was always an amount of admiration on our part for the way Canada some time since cut adrift the illuminating standard from all gas undertakings, and put them under (as knowledge and experience stood at the time) a fairly reasonable calorific standard. There was no piecemeal work about what was done. The standard fixed was 520 B.Th.U., though the technicians of the Canadian gas industry asked for 500. We learn from a paper read by Mr. Arthur Hewitt, before the Canadian Gas Association, that there is now some movement for a reduction of the standard. The war difficulties of Canadian gas undertakings are much the same as those of gas suppliers in this country; and under the strained conditions, a further lowering of the calorific standard would make a great deal of difference to the industry economically. As Mr. Hewitt says, if the gas suppliers were allowed to go down to 460 or 470 B.Th.U., it would mean little or nothing from the standpoint of consumers; and it would not, providing the gas does not contain an inordinate quantity of incombustibles. He mentions that the gas undertakings of the United Kingdom who are washing for benzol and toluol are allowed, where a mixture of coal and blue water gas is distributed, to drop under war conditions to 450 B.Th.U. This is so; and we have heard of no complaints other than from districts where the local authorities have, by test, found gas companies falling considerably below the prescribed standard. As a matter of fact, the war has been a remarkable educator to the gas industry; and the probability is we shall proceed from it to the supply of a mixed coal and blue water gas (produced independently of the coal-gas plant or by steaming the charges in the retorts), in which mixture the incombustibles will be kept to the lowest possible point. This will be a matter of more importance than a high calorific value per cubic foot—seeing that in many of the gas-heating processes flame temperature is the requirement. Mr. Hewitt finds encouragement in the fact that both the United States Administration and the Government of Canada are looking into these matters; and he sincerely trusts they will act wisely in relieving gas undertakings of uneconomical requirements. The hope has our sympathy.

Excess Inerts in Melbourne.

The inerts-in-gas question has reached Australia, and is causing trouble. According to a report in the "Melbourne Age," the matter has been raised in evidence before the Gas Inquiry Board, in relation to some erratic results of the analysis of the gas of the Metropolitan of Melbourne Gas Company. In one period there was an exceptional showing of 26·8 p.ct. of nitrogen, which can only be explained by abnormal circumstances or an accident. A test on another occasion showed 13·4 p.ct. of nitrogen, 2·2 p.ct. of carbon dioxide, and 1·2 p.ct. of oxygen—a total of 16·8 p.ct. During the evidence, too, 20 p.ct. of nitrogen was also referred to; and there was information that just before the inquiry the nitrogen dropped to 12 p.ct. Capital was attempted to be gained out of this; but we do not think overmuch should be made of it. It is, in the circumstances, possible that it was a lucky or unlucky coincidence. Before the war, the percentage of nitrogen was generally under 10 p.ct., which is good working. But, reading the evidence, one can only be led to the conclusion that the conditions have altogether altered, and that some of the conditions themselves are of a vacillating order. There are war-produced circumstances that are bound to contribute to the increase of inerts in gas, such as growing impairment of plant through stringency in respect of the supply of materials and labour, and the fact that the plant has now to be worked at high pressure. If one cannot get a sufficiency of labour and materials, plant must depreciate from the former state of soundness; and the percentage of inerts is bound to show an increase. If, too, washing the gas for benzol is proceeding, this would result in a difference. The quality of the coal also differs materially in Australia as here through the pressure of the war; and to the variations of quality can be traced variations in the excess of incombustibles. Given proper conditions, and good coal, there is no occasion for the percentage of inerts to be far from the neighbourhood of 12. At the inquiry this figure was quoted on the authority of an article in the "Journal;" but consideration must in fairness be given to the extraordinary and fluctuating circumstances under which work is conducted in these times. The Melbourne Gas Company have shown that they can work to the best standard conditions if the circumstances are favourable. This should not be overlooked in conjunction with the inconstant results of all analyses under current conditions.

Post-War Wages.

The abnormal height to which wages have been raised during the war will not be permanently maintained after the war; on the other hand, the level at which wages stood before the war is not likely to again be touched. There will be a new standard of living wage in almost every occupation. But then comes the question as to when and how there shall be recession from the present abnormal wages position. The machinery that is now in existence for enforcing wages awards made during the war will disappear at its end; but there can be no question, as the existing costs of living will only recede gradually, that wages ought to recede only in like manner. The matter is one of importance; and therefore the Ministry of Reconstruction are appointing a Committee to look into it—the lines of reference including the questions of whether compulsory operation of awards should be continued after the war, whether the power to make awards should be continued after the war, and the manner in which awards, if made or continued, should be enforced after the war, and for what period. An inquiry and report on the subject should save a lot of controversy and friction when employers come to serious grips with the matter.

OBITUARY.

News has come to hand of the death, on June 6, of Herr Karl Eylers, the Manager of the Gas, Water, and Electricity Works of Andernach, and also of the large central gas and electricity works of the Thuringian Gas Company, from which gas and current are distributed over the closely populated district stretching from Coblenz to Rolandseck. Herr Eylers was born in 1880, and became Manager of the Andernach works in 1907. His early death was due to an apoplectic seizure.

Second Lieutenant T. Jenkinson Waller, of the Northumberland Fusiliers, who has died of wounds, at the age of 25, was the eldest son of Mr. T. Martin Waller, the Secretary to the City of Durham Gas Company. In 1915, he enlisted as a private in the Commercial Battalion of the Northumberland Fusiliers, and was granted a Commission in April, 1917. During his seventeen months' service at the front, he saw continuous fighting, and it is said that not infrequently he was the only commissioned survivor in his battalion.

Scottish Junior Gas Association (Eastern District).—The opening meeting of the fifteenth session will be held in the Heriot-Watt College, Edinburgh, next Saturday afternoon, when the annual lecture will be delivered by Mr. James Dickson, of Johnstone, on "Gas-Works Economies, with Special Regard to Carbonization and the Treatment and Disposal of Residuals."

PRICE OF RETORT CARBON.

The National Gas Council announce that, on representations to the Ministry of Munitions, Mr. Dasnieres, the Contractor licensed by the Government to purchase and retail retort carbon, has been instructed to advance his purchase price of this material by 20 p.ct., in view of the increased war costs incurred by gas undertakings. The Ministry of Munitions particularly request gas undertakings throughout the kingdom to place the whole of their available supplies of retort carbon at the disposal of the Ministry. The 20 p.ct. is calculated on the last contract price with Mr. Dasnieres, and comes into operation on and from Oct. 7.

PERSONAL.

Mr. J. Gooderham, Accountant to the Richmond (Surrey) Gas Company, has been appointed Acting Secretary.

Professor W. Ernest Dalby, F.R.S., will serve on the Expert Sub-Committee of the Gas Traction Committee, in the place of the late Colonel Bertram Hopkinson, F.R.S.

On his retirement from the position of Manager of the Herne Bay Gas and Electricity Company, Mr. C. V. Bennett has been presented by the office staff and workmen with a silver cake basket. His successor is Mr. D. H. Davies, of Nantwich.

A special meeting of the Falkirk Town Council was held last Thursday, to fill the vacant position of Gas Engineer and Manager. Mr. George P. Mitchell, now Gas Engineer and Manager at Port Glasgow, who is the son of the late Mr. Robert Mitchell, of Edinburgh, was appointed, at a salary of £500 a year.

Prof. W. A. Bone, F.R.S., with the concurrence of the authorities of the Imperial College of Science and Technology, has asked to be relieved of his duties as Consultant to the Fuel Research Board on the 22nd inst., in order to be free during the coming winter to devote his attention to plans now under consideration for the post-war development of the Department of Chemical Technology at the College. At the same time, he will resume his private consulting and his other work in fuel technology which has been suspended during his tenure of the office.

Mr. D. T. Marwick, the Assistant Engineer and Works Superintendent to the Oxford Gas Light and Coke Company, has been appointed by the Directors of the Portsea Island Gas Company, Portsmouth, Superintendent of their Hilsea works. Mr. Marwick served his apprenticeship with Messrs. Tatlock and Thomson, City Analysts and Gas Examiners, of Glasgow, and completed his training with the Glasgow Corporation Gas Department, at their Dawsholm station. He was afterwards Superintendent of the Temple works, and then Assistant at Dawsholm. From there he was appointed Assistant Engineer to the Greenock Corporation Gas Department, which position he vacated to go to Oxford.

Congratulations to Lieut. J. W. Brown, of the Royal Air Force, on his marriage, last Friday, at St. Giles, Holborn, to Marie, the third daughter of Mr. Walter Harry Grosvenor, late of the South Metropolitan Gas Company. Lieut. Brown (who is the son of Mr. Thomas Brown, of the Matlock and District Gas Company) was Manager of the Barbados Gas-Works, and formerly took temporary charge at Port Elizabeth for the South African Lighting Association. It will be remembered that, in the summer of last year, we announced that he had been severely wounded in East Africa, owing to his aeroplane collapsing in mid-air. Happily a few months after we had the pleasure of greeting him here in convalescent state.

The position of Engineer to the Folkestone Gas Company, applications for which were recently invited through the advertisement columns of the "Journal," has been secured by Mr. E. Hazzard-Harman, who, after spending ten years at the Beckton and Nine Elms works of the Gas Light and Coke Company, in 1900 went to Birmingham, where he was appointed Deputy Works Superintendent at the Saltley, Nechells, and Swan Village stations, and also acted as Chief Assistant to Dr. Harold G. Colman and Mr. F. J. Bywater. In 1909, he became Assistant Engineer and Manager under Mr. A. E. Broadberry at Tottenham. Later he went to the Kensal Green station of the Gas Light and Coke Company, as Superintendent of the vertical retort-settings, and in 1911 returned to Beckton as a Senior Assistant Engineer—dividing his time between constructional work and carbonizing.

On Thursday afternoon last many business friends in Falkirk and Glasgow of Mr. William Wilson, the Gas Engineer and Manager to the Falkirk Corporation, met to present him with a mark of esteem on the occasion of his leaving to fill a similar appointment under the Burton-upon-Trent Corporation. Provost Bogle, O.B.E., presided, and wished Mr. Wilson success in his new sphere. Mr. H. Dick, of Falkirk, referred to Mr. Wilson as one of Nature's gentlemen, whose name had lately been prominently before the gas profession in connection with the extraction of chemicals for carrying on the war. He presented Mr. Wilson with a handsome gold watch and albert, along with a gold brooch and case of brushes and combs for Mrs. Wilson. Mr. Wilson returned thanks for the gifts, remarking he had never left a place to which he could not go back and start again the next day. He was doing the same with Falkirk. Mr. Wilson has received from the staff of the Falkirk works a case of cutlery, with a handbag for Mrs. Wilson.

TEMPORARY INCREASE OF CHARGES ACT.

Further Orders and Applications.

Since the reproduction in last week's "Journal" of the first Order made by the Local Government Board under the Statutory Undertakings (Temporary Increase of Charges) Act, several other Orders have come to hand.

The Borough of Glastonbury, whose maximum price is 4s. 6d. per 1000 c.ft., are authorized to charge such price as will not be more than sufficient, so far as can be estimated by the Local Authority before the commencement of the period for which the charge is made, to enable the gas undertaking to be carried on without loss during that period; but the price so charged shall not at any time exceed 5s. 6d. per 1000 c.ft. No part of any balance of revenue remaining in any year, or of income derived from the reserve fund, shall be carried to the district fund when the price charged during any part of the year exceeds 4s. 6d. per 1000 c.ft.

In the case of the Borough of Ossett, the existing maximum of 4s. is raised to 5s. per 1000 c.ft.

The Rothwell (Northampton) Urban District Council's maximum of 4s. 6d. becomes 5s. 6d. per 1000 c.ft. In this Order—doubtless because the circumstances do not require it—there is no reference to contributions to the district fund.

With regard to the Borough of Wigan, by section 41 of the Act of 1861, and section 78 of the Act of 1874, it is provided that the price to be charged by the Local Authority for gas supplied by them to persons who shall burn the same by meter within the Borough of Wigan or within a circle the radius of which would be one mile in distance from the gasholder referred to in the said section 41 shall not exceed 4s. 2d. per 1000 c.ft., subject to the allowance mentioned in section 42 of the Act of 1861, and to all other persons who shall burn the same by meter elsewhere within the limits of supply of the Corporation shall not exceed 5s. 6d, per 1000 c.ft., and so on in proportion for any greater or less quantity. In the Order, the Local Authority are authorized to charge for gas consumed within the Borough of Wigan or within a circle the radius of which would be one mile in distance from the gasholder referred to, a sum not exceeding 5s. per 1000 c.ft.

Local Government Board Applications.

The following further applications have been made to the Local Government Board under the Act.

Ashburton Urban District Council.
Coalville Urban District Council.
Hebden Bridge and Mytholmroyd Gas Board.
Morley Corporation.

SPECIAL MEETING OF THE INSTITUTION OF GAS ENGINEERS.

As announced in the "Journal" on the 1st inst., the Institution of Gas Engineers are holding a special meeting on Thursday and Friday this week. In the preliminary announcement it was stated that the meetings would be held at 10.30 a.m. each day; but according to the latest intimation, the time for assembling will be 10 a.m.

The first item to be considered on the Thursday morning will be the representation of the Institution on the proposed reconstituted National Gas Council, of which scheme information was given in the "Journal" last week.

The subsequent items on the agenda are as follows:

2.—Preliminary Report of the Gas Investigation Committee, introduced by Lt.-Col. Arthur Smithells, C.M.G., and Prof. John W. Cobb, B.Sc., Livesey Professor.

3.—Life of Gas-Meters Research Committee. Communications on "Unaccounted-for Gas," by Mr. B. R. Parkinson, M.I.Mech.E. (illustrated by a demonstration of the spraying process and by specimens of meters, &c.). "The Corrosion of Dry Gas-Meters," by Mr. J. G. Taplay, the Chief Analyst to the Gas Light and Coke Company.

4.—Report of the Refractory Materials Committee, introduced by Dr. J. W. Mellor. Communication on "The Corrosive Action of Flue-Dust on Fire-Bricks," by Mr. Walter Emery and Dr. A. Scott.

The notice of meeting points out that, on account of the Government paper restrictions, it will not be possible to furnish to all attending the meeting copies of the communications which are to be presented; but a sufficient number will be printed for the use of those specially interested, and who may desire to speak in the discussions of the respective reports.

According to an estimate that has been made, it will be possible, by stripping the gas from ten of the largest city gas plants in America, to obtain 10 million gallons of toluol a year for war purposes.

ELECTRICITY SUPPLY MEMORANDA.

Economizing Labour.

Many people are servantless nowadays. We believe that, in numerous cases, this is a blessing in disguise. It was a way of the people who had the means, when labour was more plentiful and not so dear, to get into the habit in their homes of ever doing less for themselves. Neither man nor woman was sent into this world to lead a lazy, indolent existence. The war has therefore compulsorily made most people wake up, and do more for themselves in the household, because servants are now scarce, and the earning power of labour is high. Where servants can be dispensed with, they should be, if they have the capacity for doing anything of greater value in some other line of work, either in connection with the war, or for the general good of the community. Then after the war all available labour must be put to the best possible and most efficient use; and everybody who is not selfish should make up his or her mind to do with as little labour as possible in the house, and assist in this by adopting all means of saving labour. There is big scope for the saving of domestic labour, if people would sacrifice old customs and adopt new methods, and wean themselves from those paltry displays of show at which sensible people only smile, and cannot bring themselves to admire. In short, it is the duty of every one of us to economize labour as much as possible, and make use of the power that progress has put into our possession.

Ventilation.

Information as to what can be done is given in a little book we have been reading on the "Ideal Servant-Saving Home," which book is a cheap counsellor at 1s. 6d. net. It was written by "An Engineer and His Wife;" and the authors have dealt with their subject with so much impartiality that one hesitates to treat critically a few odd points upon which one would have been tempted to have said something else. But then perhaps this would have depreciated the value of the book as being something worth putting into the hands of the rulers of the home. It is a book which, in our opinion, it would be a national advantage if it were read in every household where its precepts and instruction would be valuable. It treats of all sorts of things whereby labour can be saved; and not a few of these things are electrically operated. But here we are concerned in the main with heating. The architect who sticks to old professional formulæ and practices might do worse than see what is said in this book—simply written for the layman rather than the professional man—as to insulating houses, and about ventilation. It is anticipated by the "Engineer and his Wife" that chimneys will be built in houses for long ahead; but "in days to come when electricity is in general use for warming buildings, ventilation may be secured by means of smaller shafts built into the wall." There is something to ponder over in the words, "In the days to come!" But how long will these "days to come" be in arriving—if ever? They are likely to be very remote days judging from the comparison which later in the book shows that for heating electricity at 1d. per unit is as costly as gas would be at 8s. per 1000 c.ft. But why wait for those days? All that the gas-fire wants is a small-area shaft and not a large chimney; and the small-area shaft could be made to aid largely and at all times in the ventilation of rooms, in a way that the electric fire cannot do, but must have the auxiliary aid of an electric fan, which the writers appear to favour, though admitting the necessity for careful installation in order not to create draughts or other troubles. But such things as electric fans are not for the masses. If electric fans were to be fixed in every room of a house, installation, running, and maintenance costs would mean a considerable price to pay for the service. But when there is electric heating, an electric fan is an indispensable adjunct, if the householder does not want to suffer from air stagnation and pollution. By very simple means, gas lighting and heating can be made a most efficient ventilating agent.

Heating—Cost and Collateral Advantages.

It is pointed out that gas-fires or electric radiators lend themselves best for heating in the absence of servants. We contend that gas-fires lend themselves best for heating where there are servants, for they create less labour, and the time occupied by the servants in attending to coal fires and clearing-up all their fouling effects can be more profitably employed in other directions. To the competition of the gas-fire has been largely due the improvements in coal-consuming grates. Efforts in this direction, "Engineer and his Wife" say, have been successful. But whatever has been done in improving the combustion and economy of the coal grate, there are certain things that cannot be improved. The coal grate whatever its form necessitates coal cartage, delivery, and storage; and there must be a large waste of heat, with ashes, dust, and atmospheric pollution. All the crudeness in these particulars remain. There is no avoiding them, any more than there is the waste that the combustion of the coal entails through the total destruction of valuable constituents of the coal. None of these defects are in harmony with the progress of knowledge. The preferences of some people are still in accord with the best conceptions of a less scientific age—nothing more. The writers talk of things more rational, when speaking of gas radiators and fires, which have their respective uses and advantages when properly applied. "For private houses," we read, "open gas-fires, or the equivalent in electrical apparatus, will probably be found the best." This sentence shows the entire absence of prejudice in the book; but later on the householder finds information which will help him to make up his mind which to adopt—the gas-fire or the electric-heater. It is the present with which we have to deal, and not that "time to come" which, imagination suggests, may see electricity being retailed on a basis more on an equality with gas in respect of thermal value and cost. The world cannot suspend its heating improvements till then. Futurity must mend its own ways, as we must ours; but the terms of doing so must be worth having. "Assuming," we read, "that one-third of the heat from a good modern gas-stove goes up the chimney, while all the heat in an electrical apparatus is available for warming the room, electricity at 1d. per unit, and gas at 8s. per 1000 c.ft. are about equal in cost for heating purposes." To give the same gross thermal value as 1000 c.ft. of gas, 146 K.W.-hours would be required. But the authoritative tests for gas-fires do not allow us to claim more than 70 to 75 p.c. of effective heating from the gas-fire, though the balance of 25 p.ct. that goes up the chimney pays amply by the assistance rendered to ventilation, and by the modest cost of the effective heating relative to that of electricity. But the 70 to 75 p.ct. of the heating value of the 1000 c.ft. of gas gives as the effective heat utilized 350,000 B.Th.U., which is equal to 102 KW.-hours, which at 1d. per unit would cost 8s. 6d.—this is allowing 100 p.ct. efficiency for the electric-heater, which is an exaggerated claim. As to gas and electric cooking, the latter is not a time saver; the former is. The "Engineer and his Wife" hold the scales very fairly between the two agents. They do not, however, let themselves fall over the miserable last trench of the electricians—the shrinkage of meat. Taking the cost of kitchen work by electrical means throughout, a similar ratio to the 1d. per unit and the 8s. per 1000 c.ft. is declared to hold good. The book is well worth reading, and distributing.

The Waste of Coal per Unit Generated.

Not long ago the Coal Controller published a table which showed that the coal consumed at the electricity generating stations of the country varied from 2·48 to 16·92 lbs. per unit generated [see "Memoranda," Aug. 6]. This was after he had made that fearfully mistaken allowance of 800 units of electricity as the equivalent of a ton of coal. The compilation of actual data as to coal used at electricity stations caused him to ruminate over the waste of the thermal value of coal that is going on in electricity generation; and he called upon electrical engineers to work their hardest to economize in every conceivable way. Now it seems that he has followed up this appeal by another, which takes the form of a poster, for putting into a prominent position in electricity stations, to serve as a constant reminder as to what is required of those in charge in these days of national emergency in regard to coal. Manifestly it is necessary to remind them. "Electrical Industries" calls attention to the poster in a paragraph headed—"Teach your . . ." We can all fill in the blank; and the filling-in is a poor compliment to electrical engineers in charge of stations that are using anything more than (say) 3 lbs. of coal per unit generated. "Grandmothers" are they! Let it stay at that. It is said that the poster invites the engineer to ask himself, "How many units do we get per pound of coal burned?" And what are the units? Electrical or B.Th.U.? If electrical units, the plural term will clearly not apply. The engineers and superintendents are asked to pay the very closest attention to all recording apparatus, coal consumed, water evaporated, and ash made. The firemen and stokers are also exhorted to watch their ash heap, and look after their steam-traps, leaking joints, and so forth. Our contemporary regards all this as excellent; but, it adds, "one cannot escape from the fact that it can be only where some flagrant dereliction of duty on the part of the station engineers and superintendents is going on that the poster can effect its mission." When one looks at the pounds of coal consumed per unit as disclosed by the Coal Controller, one cannot help wondering whether some part of the wasteful expenditure is not due to a "flagrant dereliction of duty." Our contemporary has to admit that the human factor must account for some of the startling differences. It is acknowledged that "assiduous application and constant personal supervision are necessary; and it is this uninviting donkey work which is likely to be allowed to slide, whence some of the high coal costs figuring against some undertakings." Then why raise objections to the poster? There is in our contemporary the full admission of its necessity, and of the inappropriateness of the title of the paragraph "Teach your . . . ."

Mr. de Segundo's Second Thoughts.

It seems that the article Mr. Ed. C. de Segundo published in the "Electrical Review," and upon which criticism was passed in last week's "Memoranda," saw the light of day before he had had an opportunity of revising it; and, according to a letter written to our contemporary, he had intended to deal in more detail with the heat value of the gas obtained in producing coke, and with the net coke residue in the production of the gas. We are not withdrawing any of our own figures and comments. He still goes astray as to the net

effective heating value of gas to the householder used in the up-to-date gas-fire. He is also still at sea regarding modern carbonizing results. But his explanation brings him much nearer the facts of the case than the original article did, though we are unable even now to accept his figures, which we will not therefore reproduce. Among his conclusions, it is seen that he puts the *net* draft upon our fuel resources as being only about 18 p.ct. greater in the case of gas and coke heating, but at nearly four times greater for electric heating, than when compared with coal. Further, the cost for equivalent "effective" heating to the householder is, he says, nearly twice as much for gas, and over four times as much for electricity, as compared with coal. These conclusions, as seen last week, do not come up to the ones that we should ourselves have drawn from data that are more in accordance with modern gas-making practice and the efficiency of gas appliances; but they go a good step along the road, and constitute a not altogether welcome pill for our electrical friends, who have thought to strangle a strong competitor with their less efficient methods in relation to the thermal value of the coal spent under their steam-boilers.

[Since the above paragraph was written and in type, a letter has been received from Mr. de Segundo, which appears in our "Correspondence" columns.]

Moisture and Spontaneous Heating of Coal.

On account of the seeming importance of moisture among the conditions that affect spontaneous combustion in stored coal, a number of experiments were undertaken by the United States Bureau of Mines; and these are described by Messrs. S. H. Katz and H. C. Porter, who point out that conflicting conclusions are given in most of the recorded discussions of the subject. Their experiments showed that coal from Illinois oxidized faster when dry, whereas a sample of Pittsburgh coal oxidized faster when moist. These discordant results, and similarly inconsistent ones from the observations of different investigators, may, they say, be coupled with the fact that, under actual conditions of storing, both coal and air always contain a considerable amount of moisture. This has led to the conclusion that moisture in stored coal is not of practical importance as far as its chemical effects on oxidation are concerned. However, the opinion among coal-shippers and consumers, that there is more danger of spontaneous combustion during warm wet weather than during dry, may have another basis—the physical changes brought about by wetting the coal on the surface of a pile. Such wetting reduces the proportion of voids or open spaces in the mass. If the coal is divided into particles fine enough, the water will fill the voids completely, and be held there by capillary attraction. Such a mass of coal and water on any part of a pile would block the passage of air at that place. As a result, the conditions of ventilation in the pile before the wetting would be changed, so that, in some instances, the heat generated by the gradual oxidation of the coal would be retained until the temperature of ignition is reached. For instance, in a pile of coal formed in the usual manner—with the fines at the top because of the rolling-down of the larger particles—there would be a mass overlain with an impervious cover through the wetting of the outside surface. This cover would prevent air circulating by convection. Under such conditions, oxygen would diffuse, as the coal absorbed it, from the lower parts of the pile to the covered part. The heat produced would be retained in the pile; and the temperature of the coal would increase at a rate dependent on the rate of oxidation alone. Ignition temperature would readily be reached, and a spontaneous fire produced. The conditions described have been approximated to a degree in many storage piles of coal. In these piles moisture had a decided influence in the production of spontaneous fire. The only recommendation of practical import to be made as a result of the experiments is to prevent the segregation of the fine coal in building a pile for storage. This has been proposed before as a means of reducing the danger of spontaneous combustion; and the consideration of moisture now gives it further support.

German Illuminating Engineering Society.—The fifth annual general meeting of this Society was announced for Sept. 21, at the Imperial Physical-Technical Institute at Charlottenburg. The President of the Society is Dr. E. Warburg, and the programme for the meeting included a paper by Dr. H. Lux, of Berlin, on "Means of Lighting in Relation to Architecture," and one by Dr. Gehlhoff, of Friedenau, on the "Photometry of Search Lights."

The Provisional Advisory Council.—Pending the formation of an Advisory Council for the Board of Trade on a permanent basis, the President of the Board of Trade has invited representatives of various Board of Trade Committees, of the Association of Chambers of Commerce and the Federation of British Industries, and of Labour interests, to form a Provisional Council to advise the Department of Commerce and Industry. The Council also includes representatives of the Foreign, Colonial, and India Offices; and the Dominion Governments have been invited to nominate members. The Council includes Sir Henry Birchenough, K.C.M.G., Sir Adam Nimmo, K.B.E., the Hon. Sir C. A. Parsons, K.C.B., F.R.S., and Sir Richard Vassar Smith, Bart. The first meeting of the Council was held last Wednesday.

COMPRESSED GAS FOR MOTOR VEHICLES.

With the great change that the last few wonderful weeks have made in the outlook, many plans will be taken in hand for the time of returning peace which but a little while ago seemed so remote. One direction in which, as soon as circumstances permit, there will certainly be great activity is the use of gas for motor vehicles. Numerous discussions on the matter have already been reported at Association meetings; and everyone some time ago became familiar with the sight of flexible gas-containers on vehicle tops. Then the position became such that many promising schemes had to be shelved—to be revived as soon as opportunity offered. It will, we all hope, offer very soon now. Meanwhile, what is possible should be done to pave the way for the developments later on which may then confidently be looked forward to; and to that end, example is important.

In this connection, Messrs. Flugel & Co., Ltd., of Green Lanes, London, N., point out that the Gas Traction Committee, in their interim report, expressed the opinion that it was well to encourage forthwith, under special licence from the Board of Trade where necessary, a limited number of experiments on a commercial scale with compressed gas in rigid metal cylinders, in order to obtain data for dealing with post-war developments. As readers are aware, the necessary authority has been obtained to conduct some trials with twenty goods-carrying commercial motor vehicles equipped to run on compressed coal gas in the Metropolitan area. Messrs. Flugel & Co. (who have been devoting their attention to this problem for some time) recently applied to the Committee, under the section of their report just referred to, for their assistance in respect of priority, and such other facilities as may prove necessary to enable them to carry out the essential work in connection with the equipment of goods-carrying commercial motors running on compressed gas in steel cylinders. The Committee indicate their approval of Messrs. Flugel's scheme, and are willing to grant them, or each of their approved clients, a special gas permit for 250,000 c.ft. of gas (the equivalent of 1000 gallons of petrol) per annum for each such goods-carrying commercial motor vehicle; the gas to be compressed and carried on the vehicles in steel cylinders at 80 atmospheres pressure. No petrol will be withdrawn from the existing licence for one month after putting the compressed gas vehicle on the road; but after this period, one-third of the petrol allowance for this particular vehicle will be withdrawn in exchange for 250,000 c.ft. of gas. For instance, if the existing licence for a particular lorry was 60 gallons per month, 20 gallons would have to be given up in exchange for the monthly gas equivalent of 83 gallons—a clear gain of the equivalent of over 60 gallons of petrol per month, which is a most valuable concession to anyone whose mileage is at present restricted by shortage of fuel.

"If," say Messrs. Flugel & Co., "the gas companies seize this opportunity, they can make sure of an enormous permanent demand for their gas. At present the cost of gas is only about one-quarter the price of petrol; 1000 c.ft. of gas being equal to 4 gallons of petrol. Gas will always be able to hold its own against petrol, even if the latter were reduced in price to 1s. 3d. per gallon, instead of as at present 3s. 9d." The firm have everything ready to get to work at once, in conjunction with any readers who may put themselves in touch with them. Their combined reducing valve and expansion chamber, gas carburettor with air and gas valves actuated by one positive control, and steel cylinders were on view at the recent British Scientific Products Exhibition; and the offer of Messrs. Flugel to send the patent carburettor on approval, in order that users may satisfy themselves that it actually saves gas and gives better results in the running of their cars, has already been notified in the "Journal."

Absorption of Methane and Other Gases by Coal.—The United States Bureau of Mines describe experiments on the absorption of gases from various mixtures of coal. The results show that, after exposure to air, the coal absorbs twice as much as when freshly mined; the quantities being about 0·8 cc. and 0·16 cc. per gram of coal respectively. Nitrogen may be absorbed and evolved by coal. Coal in equilibrium with a mixture of nitrogen and methane absorbs gas with a fall in temperature, and evolves gas with a rise in temperature. As far as the experiments so far carried out show, the absorption seems closely analogous to the absorption of gases by charcoal.

Ammoniacal Liquor as a Fertilizer.—Some very good results by using ammonia water as a fertilizer have been obtained by Dr. F. Mach, at the Agricultural Institute, Augustenberg, Baden. At the same time, great caution is advised in this use of "gas water," owing to its poisonous character. The water in question contained on an average 1·4 p.ct. of ammoniacal nitrogen, and only little mineral substances; there being 1·11 p.ct. of dry residue and 0·008 p.ct. of ignition residue. But there were also present 0·24 p.ct. of phenols, 0·23 p.ct. of sulphuretted hydrogen, 0·196 p.ct. of hydrosulphocyanic acid, and traces of hydrocyanic acid. For these reasons, the water must be spread over the soil and ploughed under about two weeks before potatoes or seeds are sown. Ammonia in itself is, moreover, not in general a sufficient fertilizer. Most crops also need potash or phosphate. If it were not for the poisons present, however, the "gas water" would be superior to liquid farmyard manure.

AN ANALYSIS OF "GAS UNACCOUNTED FOR."

By Stephen Lacey, B.Sc.(Eng.)Lond., Assoc.M.Inst.C.E.,
Distributing Engineer of The Gas Light and Coke Company.

The difference between "gas made" and "gas sold"* has been well named "gas unaccounted for," because it has survived many attempts to give a final account of it. One of the reasons for the latter would seem to be that, although the ground of preliminary analysis has been covered by different writers again and again, no generally recognized method has been arrived at of classifying in a rational way the various factors which, together, make up the total of "gas unaccounted for;" and very little information is available as to their relative importance. It follows that it is still quite commonly held that "gas unaccounted for" is, for practical purposes, synonymous with leakage from mains and services, in spite of the fact that this view is quite unsupported by experimental evidence.

I propose in this article first to give what appears to be the most rational subdivision of the total "gas unaccounted for," and then, by taking the particular case of The Gas Light and Coke Company as an example, to show how the grouping adopted can be used as a basis for a complete investigation.

The total "gas unaccounted for" can be usefully divided into the three following parts for the purpose of determining the relative importance of the various factors involved:

(I.) That part which results from the difference in conditions of measurement (as regards temperature, pressure, and degree of saturation with aqueous vapour) of "gas made" on the one hand and of "gas sold" on the other.

(II.) That part due to leakage from the plant (gasholders, mains, and services) between the station meters and the consumers' meters.

(III.) That part due to errors of registration, either in the measurement of "gas made" or of "gas sold."

A brief consideration of the three divisions of "gas unaccounted for" given above, will show that it is impracticable to determine directly the value of the last. It is, therefore, necessary to estimate as accurately as may be the value of the first two; the value of the last part (due to errors in registration) being then obtained as a remainder.

I will proceed now to deal with the three divisions in the order given, with special reference to the conditions obtaining with The Gas Light and Coke Company.

(I).—That Part of "Gas Unaccounted for" due to Differences in Conditions of Measurement of "Gas Made" and "Gas Sold."

There is no generally recognized method of treating the measurement of "gas made;" and the methods adopted by different gas undertakings may be summarized under three heads:

(*a*) Where the registration of the station-meters is accepted as being the "gas made," without any correction.

(*b*) Where the registration of the station-meters is corrected to conditions as regards temperature and pressure assumed to bring it to the same conditions of measurement as "gas sold."

(*c*) Where the registration of the station-meters is corrected to a standard temperature and pressure.

There is something to be said for each method; but I cannot here well enter into a detailed discussion of the matter. Correction to standard temperature and pressure has the great advantage of rendering records of "gas made" strictly comparable, without regard to the place and time of manufacture. This is clearly of importance when comparisons are being made between the relative performances of different manufacturing plant. On the other hand, correction of "gas made" to as nearly as possible the same conditions of measurement as "gas sold," has the advantage of eliminating one factor influencing "gas unaccounted for."

The practice of The Gas Light and Coke Company with regard to the measurement of "gas made" is, in effect, a compromise between (*b*) and (*c*). The "gas made" is corrected to a temperature of 60° Fahr. (wet), and to a pressure of 30 in. of mercury *plus* 6 in. of water. Incidentally, no correction is made for the temperature of the mercury of the barometers, which may be taken as 60° Fahr. The addition of 6 in. of water to the standard pressure of 30 in. of mercury was made some thirty years ago in order to bring the volume of "gas made" nearer to the volume of "gas sold," and was presumed to represent the mean holder pressure.

In order accurately to determine the proportion of "gas unaccounted for," for which the differences in conditions of measurement between "gas made" and "gas sold" are responsible, it would be necessary to have complete information with regard to temperature, pressure, and degree of saturation with aqueous vapour of the gas measured by every consumer's meter. Failing this information, the following assumptions were provisionally made with regard to "gas sold:"

(*a*) That the average temperature of measurement may be represented by the average shade-temperature at Kew Observatory.

(*b*) That the pressure at which "gas sold" is measured may be represented by the atmospheric pressure at Kew corrected at an altitude of 70 ft. above M.S.L. (estimated to be the average altitude at which "gas sold" is measured) *plus* the average pressure of gas in the meters (estimated to be equal to 4 in. of water).

(*c*) That the gas is saturated when measured.

It should be noted here that as the meters registering "gas sold" are not read simultaneously with those registering "gas made," a somewhat elaborate correction is necessary if "gas sold" is to be strictly comparable with "gas made" for a specified period of time. This is a matter of accountancy which, in the case of The Gas Light and Coke Company, has been dealt with very completely.

The "gas sold" for quarterly periods has been corrected from the conditions under which it was assumed to be measured to the same conditions of measurement as the "gas made;" and the following table gives the results obtained:

	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.
Total "gas unaccounted for" (expressed as percentage of gas made) . .	**6·41**	**6·73**	**6·65**	**6·94**	**6·62**	**7·14**	**7·10**	**5·50**	**7·02**	**8·42**
Average shade temperature at Kew . . .	50·4	48·9	50·1	51·8	51·6	51·2	51·2	49·9	50·1	49·0
Absolute pressure of "gas sold" as measured (inches of mercury at 60°F.), altitude 70 ft. above M.S.L., Pressure in meters 4 in. of water .	30·32	30·26	30·30	30·31	30·14	30·28	30·27	30·30	30·23	30·28
Reduction in "gas unaccounted for"—expressed as a percentage of "gas made"—resulting from correction of "gas sold" to the same conditions of measurement as "gas made".	**2·18**	**2·33**	**2·39**	**1·85**	**1·20**	**1·76**	**1·76**	**2·18**	**1·80**	**2·39**

It is not suggested that the shade temperatures actually correspond with the average temperatures at which "gas sold" is measured; but as they may be accepted as a criterion of these temperatures, the figures in the above table under the heading of "Reduction in 'gas unaccounted for,' &c.," are relatively correct.

So little information is available as regards the average temperature of measurement of "gas sold," that it is impossible to do more than make a shrewd guess as to its actual value. All we definitely know is that it must be higher than the average shade temperature, and that the increasing proportion of "automatic" meters during the last twenty years or so must have resulted in a corresponding increase in the temperature of measurement, because whereas "ordinary" meters are generally situated in basements or other parts of a house not subject to artificial heat, "automatic" meters are commonly fixed in living rooms. While aware that the allowance is probably too low, I propose, for the purpose of this article, to reduce the figures in the above table under the heading of "Reduction in 'Gas Accounted for,' &c." by 1 p.ct., which is equivalent to assuming that the average temperature of measurement of "gas sold" is 4° higher than the average shade temperature; and in allocating, at a later stage, responsibility for "gas unaccounted for" to the three divisions already defined, I shall make use of the following figures:

—	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.
Reduction in "gas unaccounted for" expressed as a percentage of "gas made" resulting from correction of "gas sold" as described	**1·18**	**1·33**	**1·39**	**0·88**	**0·20**	**0·76**	**0·76**	**1·18**	**0·80**	**1·39**

In analyses of "gas unaccounted for," condensation is generally considered as a separate factor; but I think that the method here adopted, of correcting for it along with temperature and pressure, is simpler and more satisfactory. The assumption has been made that the gas is saturated when measured at the works, and also when measured by the consumers. The first assumption is probably justified, as the station-meters are all of the wet type. It is probable that the gas measured by the consumer is not always completely saturated; and in that event the figures referred to above would have again to be reduced—by about one-tenth per cent. for every 2° by which the temperature of the "gas sold"

* The expression "gas sold" is used in this article to represent "gas sold and used in works and offices."

must be lowered to reach the point of saturation. I have, however, ignored this factor in correcting "gas sold," as above.

(II.)—That Part of "Gas Unaccounted For" due to Leakage from Plant between the Station Meters and the Consumers' Meters.

Although the results of the experiments I am about to describe do not support the widely-accepted view that leakage and "gas unaccounted for" are interchangeable terms, this factor is none the less worthy of the greatest attention, because it is the only part of "gas unaccounted for" that is lost in a real sense. It may be divided into three parts:

(*a*) Leakage from holders.
(*b*) Leakage from defects in mains and services.
(*c*) Leakage during main and service work, &c.

Of these, the second is by far the most important; and in order to get a direct estimate of it in the case of The Gas Light and Coke Company, advantage was taken of the fact that several lengths of main of various diameters had been recently thrown out of use, to measure the leakage from these mains under service conditions. The method of procedure was to plug the ends of the length to be tested, all supplies from it having been cut off, and to connect the "dead" main to a "live" one through a wet test-meter. No test was for a less period than twenty-four hours; and correction was made for the difference in atmospheric pressure at the beginning and end of the test. The average pressure in the mains was in the neighbourhood of 4 in. of water.

In order to reduce to a common denominator the rates of leakage observed—enabling an inference to be drawn from the results as to the total leakage from all the mains in action—the leakage in each case was expressed in **cubic feet per annum per foot run of joint.**

The length of joint in all the mains in action of The Gas Light and Coke Company is rather more than three million feet; and a leakage of 95 c.ft. per annum per foot run of joint represents 1 p.ct. of the "gas made," and is equal to about 300 million c.ft. per annum.

The results of the tests, which were carried out in 1917, were as follows:

Number of Test.	Length and Diameter of Main.	Leakage in Cubic Feet per Annum per Foot Run of Joint.
1	946 yards of 26 in.	72
2	406 ,, 26 ,,	49
3	2660 ,, 26 ,,	31
4	102 ,, 12 ,, and 215 ,, 8 ,,	56
5	900 ,, 6 ,,	28
6	430 ,, 6 ,,	22
7	530 ,, 6 ,,	27

Note.—All these mains were laid more than fifty years ago.

The lengths of 26 in. main in the first three tests together made up a trunk main lying under thoroughfares subjected to the heaviest traffic of all kinds. The first section was for the greater part of its length under granite sett paving on a concrete foundation, and was found by tests made with a leakage indicator over searcher-holes along its length to be leaking so badly that it would be necessary to open on and reset nearly every joint. The heavy expense that would have been incurred in the repair, and the fact that the main could be dispensed with, were the reasons for throwing it out of action. It will be noted that if all the mains in the Company's area of supply were relatively in as bad condition, the contribution to "gas unaccounted for" would represent ¾ p.ct. of "gas made."

It would seem a fair deduction from the results of the tests to conclude that the leakage from the mains alone represents less—perhaps much less—than ½ p.ct. of the "gas made."

It is unfortunate that no opportunity of testing services on a sufficient scale to warrant drawing any conclusions therefrom has so far presented itself; but some approximate idea of the total leakage may be obtained from an examination of the relative number of escapes remedied in the mains and services. It has been the experience of the Company that more leakages are remedied in mains than in services; and it would seem to be on the safe side to attribute equal leakage to each source.

The gasholders of the Company are periodically examined and tested; and there is every reason to believe that leakage from them is small in relation to the leakages from the sources we have been considering. The same applies to losses during main and service work.

The conclusion may be safely drawn from the above considerations that leakages from all sources were less than **1 p.ct.** of the "gas made" in 1917.

The vibration set up in the subsoil in which mains are laid, and occasioned by increasing speed and weight of road vehicles, is very naturally held to be a reason for increases in "gas unaccounted for;" and consideration must be given to this point, when deducing from the estimated leakage in 1917 the leakage in other years. It is certain that vibration does increase leakage; but there are other factors that come into play at the same time as the alteration in the character of traffic that tend to neutralize its effect. In the days when the road surfaces were of macadam and permeable to gas, leakage from the mains found an easy vent into the air and often remained undetected. Now-a-days it is far otherwise. The road surfaces are generally speaking gas-tight; and the numerous underground chambers forming part of the plant of telephone and telegraph services, water and sewerage systems, &c., constitute traps where relatively slight escapes of gas are soon detected, and must of necessity be remedied. The fact that it is a common experience in London to find a small leakage causing trouble at a considerable distance from its source may be cited as an example of the gas-tight character of modern road surfaces.

Another factor tending to reduce leakages is the smooth surface maintained in well-constructed roads, which tends to neutralize the effect of heavy traffic.

There are, then, good grounds for the conclusion that leakage from the mains and services in a city such as London varies little from year to year; and the figure of 1 p.ct. of the "gas made," which it has been shown was the high limit for the year 1917, can therefore be taken as representing the leakage for each of the years under review.

(III.)—That Part of "Gas Unaccounted For" Due to Errors of Registration, whether of "Gas Made" or of "Gas Sold."

Approximate estimates have now been made of the first two parts of "gas unaccounted for" under the conditions obtaining

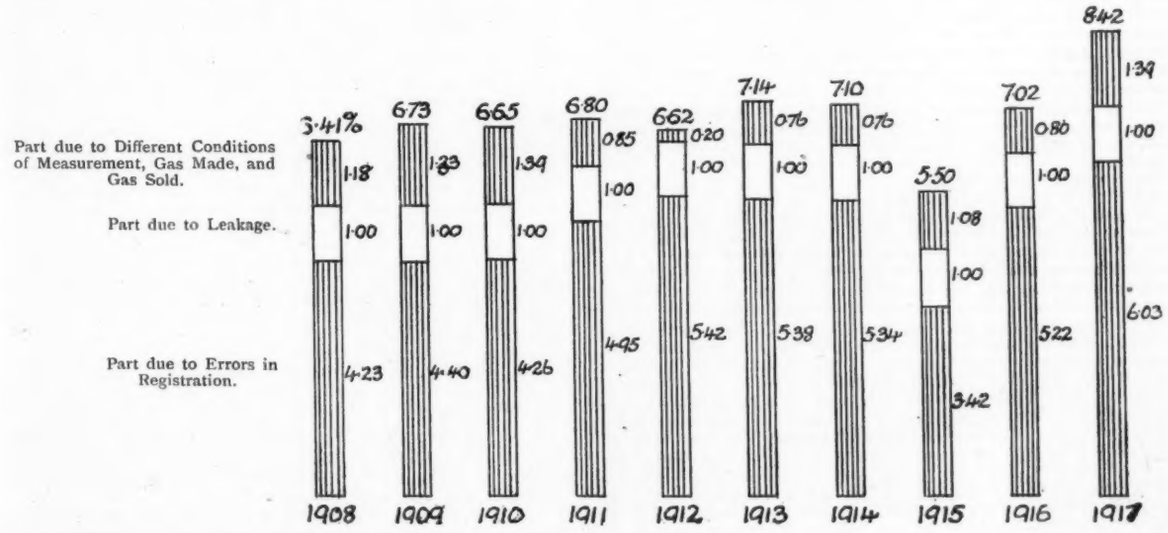


DIAGRAM SHOWING THE GAS LIGHT AND COKE COMPANY'S "GAS UNACCOUNTED FOR" (EXPRESSED AS A PERCENTAGE OF THE "GAS MADE" AND ITS COMPONENT PARTS FOR THE YEARS 1908 TO 1917.

with The Gas Light and Coke Company, and the following conclusions arrived at:

(1) That the part due to differences in condition of measurement of "gas made" and "gas sold" vary with the seasons to the extent of rather more than 1 p.ct. for the period of ten years under review, and that the average value of the contribution is in the neighbourhood of 1 p.ct. [see table above].

(2) That the part due to leakage from the holders, mains, and services in 1917 did not exceed 1 p.ct. of the "gas made;" and that the leakage for each of the last ten years may be taken to be 1 p.ct. of the "gas made" for the year.

The balance of the total "gas unaccounted for" must, therefore, be attributed to errors in registration; and the diagram appended shows graphically the relations between the three parts of "gas unaccounted for," for each of the ten years.

Examination of the diagram shows that the gradual increase in percentage of "gas unaccounted for" that occurred between 1908 and 1914 was followed in 1915 by a most remarkable reduction, which was quite unforeseen, and for which no explanation could be found. It was this drop, and the subsequent recovery in 1916, that led the Directors of the Company to appoint a Committee to investigate the matter; and the memorandum on which this article is based was written for the information of the Committee. Provided that the conclusions summarized above were correct, it was clear that the explanation of the drop in 1915 must be sought in conditions peculiar to that year, affecting the registration of consumers' meters.

For details of the subsequent investigation I have pleasure in referring to the "Life of Gas-Meters Research Committee" communications to the forthcoming meeting of the Institution of Gas Engineers by Messrs. B. R. Parkinson and J. G. Taplay.

BLUE WATER-GAS PRACTICE.

A Discussion at the Eastern Counties' Association Meeting.

In last week's issue publication was given to the paper on the above subject which Mr. E. F. Keable, of Gorleston, read at the recent meeting of the Eastern Counties Gas Managers' Association. To-day we give a report of the discussion.

The President (Mr. H. R. Wimhurst, of Bury St. Edmunds) remarked that the paper was a most useful one; and he suggested that those members who had had experience of steaming in vertical or horizontal retorts should add information to the discussion.

Mr. Thomas Glover (Norwich) said he had had the pleasure of seeing the plant described in the paper. Probably Mr. Keable was spurred on to put in this plant by what he (Mr. Glover) said at the meeting of the Association in the spring of 1917. He had only words of commendation for the paper and its subject. Mr. Keable was to be commended for his enterprise, and congratulated on having quickly got in this plant at a time of great difficulty in procuring any kind of plant. He was also to be congratulated upon having got the plant to work so readily, and upon the results having come up to his expectations in every way. He had told them that the mixed gas caused no trouble to consumers; and that it was satisfactory for incandescent lighting and heating-stoves. Mr. Keable was using 25 p.ct. of blue water gas; he was therefore saving one-quarter of the coal. This was a substantial figure. A great many managers in the room would be glad if they were saving 25 p.ct. of coal, or rather were making gas with 25 p.ct. less than at the present time, and putting the saved coal into store instead of into the retorts. The plant described contained several items of novelty. He (Mr. Glover) was not there to bless or curse the plant; but it seemed to him to contain some important features, which would be watched with a great deal of interest. It was a twin generator. The generators were blown-up in parallel; but gas was made when steam was passed through in series. There was an important point here. The fuel beds were blown-up to incandescence with greater facility through having half the depth; whereas the decomposition of the steam was increased by having to pass it through two fuel beds, and before doing so by highly superheating the steam. These were the basic principles of the very interesting plant at Gorleston. It was too soon to say whether or not the form of construction was going to stand the ordinary wear and tear to which such plant was subject, whether the midfeather wall would remain gas-tight, and whether Mr. Keable would think that this more complicated form of generator was worth retaining in comparison with the simple form that many were using. The plant had also an additional advantage to which attention had not been drawn. This was that it gave a definite depth of fuel bed. The two magazines or hoppers, which were very much like two vertical retorts, with open ends discharging into the fuel beds, had always a reserve of coke to take the place of that which was reduced to ash; and the coke was in the very best condition when it dropped from the hoppers into the fuel bed. It had been dried, and was red hot when it descended to the fuel bed, because the blue water gas leaving the fuel bed passed through the coke reserves in the magazines. This was an advantage. Then it was pointed out that the gas in leaving the fuel beds passed through the coke in the magazines; and so the gas was strained by the coke, and left the plant free of fine coke particles. This was an important matter, because otherwise these coke particles were apt to get into the scrubber and condenser in the subsequent part of the plant. Mr. Keable did not tell them what he calculated the cost of the gas to be. He (Mr. Glover) took it that Mr. Keable was satisfied with the economy of the plant, seeing that he could make blue water gas and, by judicious mixture with coal gas, the consumer was getting the quality of gas which suited him all right. The flame temperature of the gas was higher, although the calorific value of the gas was calculated at something over 300 B.Th.U. He was not sure whether Mr. Keable had not gone beyond the theoretical calculation; and he must see that he was not claiming too much. He should also like him to look into the question of sulphur. He fancied Mr. Keable had missed out a decimal point. The paper spoke of 113 grains of sulphur per 100 c.ft. What did Mr. Keable get in his coal gas?

Mr. Keable: This is the raw gas; and I am speaking of the total sulphur contents—sulphuretted hydrogen and carbon bisulphide.

Mr. Glover (continuing) said the sulphur compounds contained in blue water gas were extremely low—only about 7 grains, in place of some 40 grains in crude coal gas. This was another advantage to recommend this gas, because, in introducing blue water gas, they were applying a direct means of diminishing the total sulphur compounds in the finished gas.

Mr. W. B. Farquhar (Ilford) said the plant was very compact, was self-contained in one shell, and was suitable for small or medium-sized works. One thing that struck him about it was that no dust got through with the blow. In the ordinary Dellwik blue water-gas plant, they got a tremendous amount of dust coming out of the stack-valve with the blow, so much so that it was sometimes a great nuisance. They also often had dust blowing through the carburetted water-gas plant. Was it due to the construction of the plant that Mr. Keable got no dust, or due to the fact that he was using coke from his best coal? The blow certainly passed up through the nostrils and chequerwork; but still one would naturally think that the blow would carry some of the dust. He also noticed that Mr. Keable passed the gas from the relief holder through a Rotary meter, but was not quite sure whether there had been sufficient time to obtain any effect of the gas upon the meter. He knew of one instance where the blue water gas from a Dellwik plant was measured through a "Rotary" meter; and, in course of time, the meter went slower and slower until it stopped. He looked into the meter; and it was found that the vanes were full of a deposit something of the nature of a fine powder. This might be due to the circumstances and the arrangement of the plant, and the same effect might not be found with the plant at Gorleston. It was, however, a point the writer of the paper might keep his eye upon, to make sure the meter was registering correctly. Looking at the drawing showing the construction of the plant, another point occurred to him. In the ordinary carburetted water-gas plant, it was necessary, as everyone knew, to renew the chequerwork from time to time. This was easily done. He should like to know whether the size of the plant was insufficient to allow a man to get down to renew the chequerwork bricks without having to take a great deal of the plant to pieces. If it meant removing a considerable portion of the structure, the keeping of the plant in repair might become an expensive item. In the generating shell of a water-gas plant, it was very usual to have the brickwork in the generator as a double lining—the blocks being built in such a way that they broke-joint. He noticed in the sketch that it was only single block work, and so they got a joint running through the lagging. If the steam percolated through the joint, they were going to get the shell badly eaten away. He had had experience of steam getting through the lining; and the shell suffering in some parts as a result. He noticed the author had adopted a step-grate. Did he find any difficulty from clinkering, or did he merely get ashes which could be easily raked out? In the ordinary water-gas generator, some people were finding, with the present class coke, that it was extremely hard work for the men to get out the clinker. They had to employ clinkering-bars, which they used as battering-rams, which did damage to the brickwork of the generator. If the step-grate was a better method, and helped to keep down the clinker (as he understood it did), they might look round, and see whether they could convert the grates of their own generators to something like this one.

Mr. A. W. Sumner (Grays) remarked that Mr. Keable said the calorific power of his mixed gas was 520 B.Th.U. gross, and that he had found no difficulty with regard to the consumers on the district. He (Mr. Sumner) was not surprised at this. He only wondered why Mr. Keable felt he could not go further than 31 or 32 p.ct. mixture before worrying about trouble in this direction. From his (Mr. Sumner's) experience, he might add 50 p.ct. of blue water gas if he had been able to get his B.Th.U. up to such a high standard. Of course, the make of gas per ton of coal from the horizontal retorts had a bearing on how far it could be diluted. As to the question of vertical retorts and steaming, to make coal gas and add 30 p.ct. of blue water gas made by a separate plant was, to his mind, a much more expensive way of working than producing 25 p.ct. of blue water gas in vertical retorts. They did this without any additional labour except on the boilers. Steaming in vertical retorts did not require additional labour; it was only additional fuel that was wanted. He personally would have no hesitation in putting vertical retorts into a small works; and he was not at all sure it was not the best plant to adopt in these days when they were trying to conserve coal. And they would have to try to conserve coal after the war was finished as well as at the present time. They ought not to be prejudiced with regard to these different kind of retorts. In his own case, they were making blue water gas outside. He was using blue water gas in his verticals, and adding more in the mixture. But he did not claim 520 B.Th.U. for the mixture. His consumers were satisfied, and ran gas-engines with the gas.

Mr. R. G. Shadbolt (Grantham) pointed out that the charging hoppers so resembled vertical retort sections that one naturally asked the question whether these vessels were not capable of settling the problem of the complete gasification of coal. He believed the claim was made for this plant that it was capable of doing this. He had made it his business to inquire how this ran out in practice; but so far he had been unable to discover anything.

Mr. J. H. Brearley (Longwood) remarked that Mr. Sumner had anticipated some of the points that he had himself intended to make. He should have been very much surprised if Mr. Keable had any complaints while supplying gas of 520 B.Th.U. gross. Previous to installing this plant, the calorific value of the coal gas was stated to have been 660 B.Th.U. gross, which was probably too high for getting the best duty out of incandescent burners, and many of the appliances in use on the district. Certainly the 520 B.Th.U. gas was more likely to give satisfaction than the high-grade gas that was being supplied

previously. When Mr. Keable had had further experience, perhaps he would give the industry the actual working costs, because after all that was the *crux* of the question. They would like to know the cost in comparison with other systems. Mr. Keable was inclined to think that water gas separately added to coal gas in the form he had described in the paper was better than verticals for small works. He was largely in agreement with him, because the vertical unit was too large as a rule for small works. If vertical retorts could be put up in smaller units, he thought they would have a much wider field in small works than at present. Another reason why vertical retorts were not so suitable as a separate generator in the present war days for water-gas manufacture was that the verticals were limited to a very considerable extent by the quality of the coal passed through them. If he were at liberty to select the coal for his verticals in these days, he would have washed nuts. He had no doubt whatever that it was possible to make from 20,000 to 24,000 c.ft. per ton of coal by steaming in vertical retorts if he could get the right coal; but they were bound to take the same qualities of coal as in pre-war days, when using horizontal retorts. Therefore, with six or seven different kinds of coal, steaming results always varied greatly. Sometimes they made 14,000 to 15,000 c ft. per ton; but at other times he might be making 18,000 c.ft. This depended on the coal. With a separate generator, they could keep the admixture of water gas much more even as a percentage than they could with verticals, unless working with a single kind of coal in the verticals. It had, however, been a source of great comfort to him to be able to steam in vertical retorts. They would have been much more behind with their coal stocks had it not been for verticals. In spite of all the great economy in coal consumption, however, they had then less than a week's stock of coal. There was no doubt whatever now that the gas of the future would be a coal gas mixed with water gas from one source or another; but the ultimate source of the water gas, he did not think had yet been decided. Although a user of verticals, he would not say at the present moment that they were the things in all circumstances; there were other considerations involved in the question.

Mr. W. W. TOWNSEND (Colchester) agreed with Mr. Farquhar that this plant was particularly suitable for small works, where the ground space occupied was a very important consideration. The drawing and description of this particular process were very taking. There was something fascinating about the theory of the process; and as Mr. Glover had explained the basic principles, one would expect to get a much higher efficiency. But they as gas engineers were accustomed to look at results; and when he examined the results given by Mr. Keable, he could not see that the theory was borne out in practice. With all the wonderful depth of fuel, the running in series, and all the devices that were adopted in this plant, he could not see that Mr. Keable was getting any better efficiency with regard to the amount of water gas made per ton of fuel than was usually obtainable with a properly constructed water-gas plant. The test mentioned in the paper gave 29·8 lbs. of fuel per 1000 c.ft., allowing for the fuel returned to the boilers. At Colchester, they were doing this regularly with an ordinary water-gas plant, which had been brought up to date. There was this further fact to bear in mind: It was all very well to instal plant to make a certain percentage of blue water gas; it was a great advantage, at the same time, to be able to make a considerably larger amount of carburetted water gas if occasion required. In smaller works it might not be necessary; but in larger works it certainly was. They had also to consider this plant in regard to oil results. Without having seen the plant, he should say that in making carburetted water gas a lower efficiency would be obtained than with the older style of a separate carburettor. If they wanted a high efficiency from oil, they must not splash a lot of it on to a hot surface; they must have a fine mist which was taken up by the hot water gas coming up from the generator. He should not think it was expected to get such a high efficiency from the oil used in this plant as in the other plants to which he had referred. If Mr. Keable had figures as to candle power per gallon, it would be interesting to have them. They should look for further information from Mr. Keable. For example, the fuel used in the boilers was an important consideration. He should also like to know the size of the grate, and have particulars as to the clinkering. There was a lot of surmise about this. They were shown a drawing of a step grate, which, it was supposed, would make clinkering more easy. He should like to know whether, as a matter of fact, there was less time occupied in clearing the grate, as well as the time absorbed in clearing the fires, because during this period they were never making gas. The step grate was not peculiar to this system. It was being supplied now to the ordinary pattern of single generator. Undoubtedly one would expect to get some advantage from it. He must say he thought Mr. Keable's calorimeter must be wrong. His coal gas was credited with 660 B.Th.U., which was an extraordinary figure; and his water gas, as Mr. Glover had pointed out, was 331 B.Th.U. Mr. Keable had not told them what was the percentage of carbon dioxide in the blue water gas. He (Mr. Townsend) had never exceeded 4 p.ct.; and he could not get much above 305 B.Th.U. in the blue water gas. He should like to know how Mr. Keable did it. Unless there was a great deal of methane or some other gas, he should think it was not possible to make blue water gas of this quality. The 520 B.Th,U. in the mixed gas was also fatal. Mr. Keable, he noticed, said that no trouble had been experienced on the district, and no adjustment had been necessary of the gas and air holes of the gas appliances. He did not think much notice need be taken of that. There were a good many people who in other days used to say the gas was bad; but nowadays they were not making complaints. But he did think they ought to alter the adjustment of the gas-fires for apparatus whether or not people complained, because, in his opinion, it was advisable. Take a gas of a certain specific gravity—say, a coal gas of about ·45—and dilute it with water gas, so increasing the specific gravity. At the same time, they got a much shorter flame, and so must naturally interfere with the efficiency of gas-fires and apparatus of this kind. He had heard people, who had no connection with the gas industry, say that gas-fires did not give so much heat as they used to do. The burners had been set for a certain type of gas. The fuel had been altered; and he feared that the fires, in these circumstances, were not giving so much heat as formerly. He held that adjustment ought to be made. With regard to the concluding paragraph of the paper, he (Mr. Townsend) had the courage of his opinion. It was the correct thing nowadays to say that benzol recovery had come to stay. He disagreed with this. They were recommending two things which were antagonistic. If they were going to put into the gas a great deal of blue water gas, whether in vertical retorts or by means of a separate generator, it would pay them to leave the benzol in the gas, and thereby improve the heating and lighting power. It would also enable them to put in more water gas than they would otherwise be able to do. He would admit that during the war it was quite another matter. Benzol had to be extracted now; but he did not think it would do to dogmatize as to what the position would be afterwards. He moved a vote of thanks to the author for his excellent paper.

Mr. H. G. RUGGLES (Leighton Buzzard) seconded the motion, remarking that Mr. Keable had shown not only that he had done his level-best in trying to save coal by adopting this plant, but he had displayed great initiative by adopting this particular method for water-gas production. It enabled him to view with greater equanimity the shortage of coal stocks. A great deal of valuable information had been brought before the members by the paper and discussion.

Mr. KEABLE, replying to the discussion, thanked the members for the way they had received the paper. Mr. Glover had raised the question as to the wear and tear of the plant. He could not, with the short time he had been at work with it, say anything on this score. The capital outlay on the plant was extremely small, compared with any other type that he saw at the time he was looking round for a plant; and if the wear and tear should prove with time to be somewhat higher, the fact as to lower capital expenditure would be some off-set. In regard to the calorific value of the gas, he could only say that one class of coal was carbonized separately, and the coke used for the water-gas plant. The carbonizing heat used was not so great as was usual; and so, as Mr. Townsend said, there was a certain amount of methane produced which helped to improve the calorific value of the water gas. Mr. Farquhar raised the question as to coke dust. He could not say exactly why it was that there was no trouble with this plant, except that there was no blow up right through the incoming coke. As to the meter, it was made specially for the purpose, and there was also the arresting action of the chequerwork; and he found its tendency was rather to be slightly fast than slow. Of course, he could not say yet what the life of the meter would be. Regarding the renewal of the chequer-bricks, he could only say that as the chequerwork was originally built from the bottom to the top with a man inside, renewals could, as a matter of course, take place in the same way. There was probably something in the point as to the straight joint, and the chance of steam percolating through and injuring the shell. But, of course, this again was a question that could only be determined by time and experience. The step-grate fulfilled expectations; there was no hard clinker at all—only ash. He knew one plant that had been at work for two years with a step-grate; and this meant a big saving in labour. There was also the saving of wear and tear through the use of the step-grate, and this was an important item. Their make of coal gas was about 11,200 c.ft. to the ton. In regard to steaming in vertical retorts, he did not think the process had been working sufficiently long to come to any conclusion as to the ultimate depreciation on the brickwork of the vertical retorts. This might prove a considerable point against steaming. Mr. Shadbolt raised the question of the complete gasification of coal. The plant was put down primarily for blue water-gas production; and the makers did not in any way attempt to force the question of coal prominently before him. It was, however, an interesting point, and he had tried a small quantity of coal mixed with coke in order to see practically what could be done in the direction indicated by Mr. Shadbolt. The only difficulty would be the hanging-up of the coal; but, if non-coking coal could be carbonized, there did not appear to be any reason why, if desired, it should not be used. Providing the question of the charge hanging-up could be got over, he saw no reason why coal should not be employed, providing it was of the right class. Mr. Brearley raised the question of costs; but the plant had been running so short a time that it was impossible to give any information of a reliable character. Mr. Townsend raised several questions. He (Mr. Keable) appreciated the remarks as to the oil side of the question; but there again, he had had no chance of testing the makes, because his delivery of oil only came in about three or four days before the meeting. Of course, the plant was primarily for blue water gas. There was no intention of employing oil, except in case of emergency. The boiler used was the one that supplied steam all over the works; and there had been so many alterations the last two or three years, that it was impossible to get a reliable figure for the cost of the steam. So far as the carbon dioxide was concerned, it was in the region of 4 p.ct.; but if he had the gravity and the calorific value right, he did not bother much about the carbon dioxide. Clinkering was performed every twelve hours; and the plant was completely cleared out once a week. With a step-grate, there was no hard clinker at all; it fell down as ash. He was quite satisfied with the step-grate principle.

Manchester Junior Association Prize Scheme.—In the course of the proceedings (reported last week) of the Manchester Junior Gas Association, the Hon. Secretary made a statement regarding the members' prize scheme. In order, he said, to encourage the habit of thoughtful observation, Mr. Samuel Tagg, of Preston, in 1913 offered to award two prizes, value one guinea each, for the best two papers describing or commenting on plant, apparatus, or methods of working noticed on the visits. Mr. Franklin Thorp the following year offered two more prizes to carry on the scheme; but as only three papers were submitted, the Adjudicator advised the withholding of the awards until the next session. Unfortunately, in that next session no papers whatever were submitted. Mr. Thorp, however, had renewed his offer, and members were asked to respond. The description or comments have to be the result of independent observation and of original deduction.

WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.

Half-Yearly Meeting at Swansea.

After an adjournment of a fortnight necessitated by the railway strike, the Institution last Wednesday met in Swansea, in fair numbers though in anything but fair weather, to hear the Inaugural Address of their President, Mr. Reginald G. Clarry, the Engineer, Manager, and Secretary of the Swansea Gas Light Company, to inspect the works under his charge, and to discuss a paper on the important question of leakage and main-testing. The visitors found their welcome a cordial one, and all fully appreciated the efforts—or rather the determination—of the Company to make the meeting a success. In but one respect were they disappointed. Instead of meeting, as had been hoped, the Deputy-Chairman of the Company, they arrived only to learn of his sudden death the previous day.

The Business Meeting was held in the Royal Institution of South Wales; and at the outset of the proceedings the chair was occupied by the retiring President—Mr. J. Mogford, of Briton Ferry.

A Vote of Sympathy.

Before proceeding to the general business of the meeting,

Mr. Mogford said that, since coming into the room, he had with deep regret heard of the sudden death of Mr. W. J. Rees, the Deputy-Chairman of the Swansea Gas Company, who had intended to be with them that day. Mr. Rees had for many years been connected with the Company, and had been associated with the town generally in such a way that he was part and parcel of it and of its progress. His death would, therefore, be a great loss to the town. The members would doubtless wish to pass a vote of sympathy with Mrs. Rees and her family in their bereavement; and he proposed this.

Mr. George Andrews (Swansea) said he would like to second the resolution just proposed. He had been associated with Mr. Rees for many years, both privately and in the business of the Swansea Gas Company; and it was a matter of deep regret to him that Mr. Rees would not be taking part in the day's proceedings, as he had fully intended to do.

The resolution was passed by the members rising silently in their places; and it was agreed that the Hon. Secretary should communicate it to the family.

Minutes of the Last Meeting.

The Hon. Secretary (Mr. Octavius Thomas, of Pentre) read the minutes of the last meeting; and they were confirmed. He also read some letters of apology for absence; these including communications from Mr. Thomas Canning and Mr. J. H. Canning.

New Member.

Mr. Joseph F. Rust, of Newport, was, on the proposition of Mr. Evan Rees (Margam), seconded by Mr. W. C. Jackson (Neath), elected a member of the Institution.

The Incoming President.

Mr. Mogford remarked that it was not necessary for him to say anything in introducing to them their new President, Mr. R. G. Clarry. He was sure the Institution in that gentleman's hands would progress as rapidly as the industry itself wished to progress. It would really be presumption on his part to say more in introducing to them as his successor the Engineer of the second largest concern in the Principality.

Mr. Clarry (who, on taking the chair, was greeted with applause) expressed his appreciation of the great honour they had done him in electing him President, and assured them that nothing should be left undone which he could do to foster the interests of the Institution. He was fully aware that before a successful year of office could be fulfilled, it was necessary to have the assistance of the Hon. Secretary, and the support of the members generally; but of this he felt assured. His first duty was the pleasant one of proposing a hearty vote of thanks to the retiring President. They all of them knew Mr. Mogford; and there could be no doubt about the success that had attended his year of office. He must really feel proud of it himself.

Mr. R. A. Browning (Neath), in seconding, said it was a great pleasure to him to do so, because he and Mr. Mogford had known each other for many years. Mr. Mogford was with him for some years; and he could not speak too highly of him and his determination to go thoroughly into everything. His year of office had been gratifying to himself and the Institution.

Mr. Mogford, in acknowledging the vote, which was cordially passed, said he had done his best to help to pave the way towards the forthcoming reconstruction in the industry; and he hoped that South Wales would see that, in any coming alteration or reconstruction in the management of the industry, they kept well to the front.

The President then proceeded to deliver the following

PRESIDENTIAL ADDRESS.

Our assemblage to-day in Swansea, by the courtesy of my Directors, affords me another opportunity of expressing my very sincere thanks for the honour you have conferred upon me by electing me your President. Much useful work has been done in the past by our Institution; and daily the tendency is to concentrate and act collectively. You may be assured that I shall use my utmost endeavours to work for our mutual interests, and to emulate, as far as possible, the admirable example set by my predecessors.

Last year the incoming President expressed the hope that his period of office would see the termination of this disastrous war. I can only repeat this most sincere hope, with an opinion that there seems at the present time a distinct possibility of its attainment during my tenure of office.

Situation Affecting Gas Undertakings.

The general situation to-day with regard to gas undertakings may be summarized by showing the rapid growth in importance of the industry. It is difficult to say which of the products produced at gas-works to-day may be regarded as of the greatest benefit and importance. I would prefer therefore to leave that to individual opinion. Sufficient to say that gas still remains the essential product.

The importance of gas in the war cannot be under-estimated. Hundreds of shell factories, munition works, and similar industries are mainly, and in numerous cases solely, dependent on the supply of gas for their heating, melting, and furnace processes, and for their power and lighting. In welfare work and canteens of large industrial works gas unostentatiously performs work of national importance. Then, again, there are hospitals—whether military, red cross, or permanent institutions—which would be incomplete without gas. In fact, we have a Red Cross Hospital in this district in which gas is the one and only fuel—performing all the heating, cooking, lighting, and sterilizing, and finally reducing to ashes in an incinerator all the destructible waste emanating from such an institution.

In the household, gas is daily saving the country many tons of coal, and liberating labour from domestic duties to work of a more useful character. Owing to limitations in the use of household fuel, and the necessity for economy in food, communal kitchens have sprung into existence, and are being utilized throughout the country. South Wales will no doubt be given an opportunity to establish national cooking for the public benefit; and it is possible that in outlying districts travelling kitchens will be adopted—gas being provided for cooking the meals and as the driving power for the van. This list of important work performed by gas is by no means exhausted; but it will suffice.

Coke, Benzol, Ammonia, Tar, etc.

Gas-works also have an alternative smokeless fuel for disposal in the form of coke. On most gas-works coke is graded and sorted according to quality and size, until we arrive at the cheapest solid fuel purchasable to-day—namely, coke breeze. The fuel value of coke breeze is naturally low; but many large works rely on it entirely for the whole of their steam-raising plant. Consequently, even breeze is important as a coal saver. Ordinary screened coke is not generally regarded as an indispensable fuel. But to give only one instance. Bakers would be unable to bake and supply bread without coke, as practically all existing bakers' ovens are designed to only consume this gas-works product. In the domestic grate, coke has not been appreciated to the extent it will be when we have passed through a few winters of coal shortage, and gas undertakings have realized the wide field of enterprise that exists in most districts for coke fuel.

Among the bye-products, benzol and toluol must rank of the first importance; but upon the basis of this conclusion we are not permitted to dwell. Gas-works have always produced benzol and toluol; but, speaking generally, their recovery is a war emergency, and a proceeding which has no doubt come to stay.

It is not necessary to remind you that practically the only source of the world's supply of ammonia is obtained from the distillation of coal. The ammonia recovered in gas-works is therefore of considerable importance. During the war period, many gas-works are marketing it in a concentrated form for war purposes; but the most general form of recovery is sulphate of ammonia—so valuable as an artificial manure. Before the war the bulk of the sulphate of ammonia was exported to various parts of the world. Home agriculturists were evidently not appreciative or educated up to the advantages of this high quality fertilizer. It is significant of the importance of sulphate of ammonia to say that the Food Production Department have virtually commandeered the whole production of sulphate for home agriculturists. In this connection, our bountiful harvest is certainly not without significance.

The derivatives of coal tar run into several hundreds; the number being added to almost daily. The fundamental requirements of the new British dye industry are obtained from coal tar. Numerous chemicals, medicines, and the sugar substitute (saccharine) are also obtained from this most wonderful and complex gas-works product. After the extraction of these and other valuable and interesting constituents of coal tar, there remains a tar suitable for road spraying, and, at a still further stage, the solid residuum pitch—which is used principally in the manufacture of patent fuel—adds its quota as a saver of coal. There is also a more recent

discovery that gas-works can produce fuel oil suited to the requirements of the Navy.

With the recovery of sulphur for the manufacture of sulphuric acid, the record of useful products from gas-works is by no means exhausted; but sufficient has been stated to prove the enormous importance of our industry.

THE SITUATION AS AFFECTING GAS CONSUMERS.

The situation to-day is one that should give gas consumers cause for wholesome satisfaction and self-congratulation. This view was quite recently brought to my notice by the remark of a fellow passenger (entirely unknown to me) in a railway train passing a very large gas-works, and the appearance of the gasholders excited the remark to the friend who was with him, "Thank goodness we have gas to rely upon." This fact is slowly, but surely, gaining ground among the great bulk of gas consumers. After a little calm consideration of the subject, consumers must realize that in gas supply they are getting a continuous service always at their command, which is indeed something unusual during the present time of war conditions and expenditure.

The quality of this highly manufactured commodity, while it is changed in certain characteristics, practically retains its pre-war heating efficiency. The standard of illuminating power has given place to other conditions; and the change is undoubtedly permanent. The recovery of these constituent illuminants represents a salvage of waste to the benefit of all, particularly to the nation. The consumer will find he is now supplied with a gas that requires less added air for combustion in his burner, the flame of which is smaller, more intense, and admirably suited for all purposes, except for consumption in an open burner for purposes of illumination. It is a curious anomaly how the householder will purchase necessities at 50, 100, or even 200 p.ct. increase over pre-war prices with little more than a passing comment, while he gives a greater measure of attention, entirely disproportionate, to a matter of 30 p.ct. increase in the cost of his gas.

POSITION OF GAS SHAREHOLDERS.

The position of gas shareholders is not what it should be. The gas industry owes much to the great investing public who have subscribed for, and rendered possible, the enormous growth of our national industry during past years. Any diminution of the public confidence in gas securities will at once react upon the national development of the industry. This would obviously be against national interests, and against the consumers themselves. Gas shareholding interests to-day are focussed upon the new Statutory Undertakings Act and the events leading up to its entry on the Statute Book.

FINANCIAL HARDSHIPS ACT.

The Statutory Undertakings (Temporary Increase of Charges) Act, 1918, after great effort on the part of the industry, provides the one exception of our times by conceding a meagre and totally inadequate consideration to gas shareholders of three-fourths of pre-war dividends, which in my Company's case was a modest 5 p.ct. per annum. With maximum dividend companies, there cannot possibly be any just or equitable argument why their shareholders should not receive at least full pre-war dividends.

It will be recollected that in the spring of 1915, when the requirements for munitions necessitated the inauguration of the Ministry of Munitions, the gas industry was appealed to (through Lord Moulton and the High Explosives Department), and was consequently one of the first general industries in the country to produce war munitions. Gas engineers patriotically gave their services, time, and experience without question of remuneration; advised their undertakings, mainly on patriotic grounds, and this advice was universally accepted by directors and gas committees. Consequently, the enormous resources of the gas industry (provided by the shareholders and others) were placed at the disposal of the Government. Later on other industries were brought in for the production of war materials. These apparently dealt with their matters on a purely business footing, which they turned to good commercial account.

It would appear that the weight of consideration given by the Government is in proportion to the extent one may exploit the war necessities of the country. Further, that if the gas industry had throughout been less unselfish, they would have commanded more respect and consideration when financial difficulties became so acute as to render imperative some alteration in certain of their hopelessly antiquated statutory obligations. Every reasonable minded man deprecates extremes. But "necessity knows no law;" and we cannot go on piling up cost on cost to the benefit of other branches of industry without any adequate return. What would happen to the community if the ever-present gas supply refused to render its services until the many grievances from which it suffers had been adjusted? It is unthinkable that gas authorities should have recourse to such drastic measures; but short of actual stoppage, we must use every influence and argument in protesting against the unwarrantable injustice meted out to an unselfish and non-profiteering industry.

BENZOL RECOVERY.—TAR DEHYDRATION.

Now that oil-washing of the gas has superseded tar-washing in most of the larger gas-works, a few observations on the recovery of crude benzol at Swansea will no doubt add to your interest this afternoon. Owing to the quality of gas coal obtainable in South Wales, and the expediency of limiting the stripping of the gas, the process is at the present time, even with the Government subsidy, one of doubtful commercial success—having regard to the very small return for the work involved, and the serious risk of stoppages in the district through naphthalene deposits. The whole of our production of gas is oil-washed in a rotary washer-scrubber, immediately after the tower scrubbers and prior to the purifiers; this position being the only suitable one available.

The proposal to install an oil-debenzolizing plant embodied also the erection of a tar-dehydration plant; and as the former plant had to be fixed at some distance from the oil-washer, it was decided to consider some general arrangement which would embrace as much as possible both plants. A suitable arrangement was eventually arrived at. The special advantages derived from the combination are as follows:

I.—The various storage tanks for wash oils, light oils, and benzol, together with the bases of the heat exchangers and oil coolers, were able to be enclosed in one common pit.

II.—The pit, made of reinforced concrete from materials and labour available on the works, was perforce of some considerable area; and as the storage tanks were supported on raised cradles, it was possible to make use of the bottom of the pit as a water reservoir, and to circulate water by means of one pump only from the pit to the condensers of both plants. A considerable saving of water for cooling purposes has been accordingly effected.

III.—The flat roof of the house erected for the various pumps served as an excellent position for an overhead dehydrated-tar storage tank, as, apart from it being possible to load from it into both rail tanks and barrels, advantage is taken to utilize the exhaust steam from the pumps to heat the tar in the tank by means of an internal pipe line, thereby facilitating quick loading in cold weather.

IV.—Suitable connections were easily made to permit the tar-dehydrating plant being conveniently used to treat the wash-oil if required.

V.—Both plants can be operated simultaneously by the same attendant.

All the various pipe-lines are so arranged that the pumps are interchangeable, while perhaps other unusual features of the plant are a gravity feed tank to the still, a recording thermometer at the inlet of the still, ferro-concrete naphthalene settling tanks, and a gas-fired steam superheater.

On a basis of 65 p.ct. crude benzol at 120° C., we are recovering an average yield of 0·58 gallon per ton of coal. This can be considered a satisfactory yield, having regard to the quality of the coal carbonized.

The tar-dehydrating plant has given us unqualified satisfaction, although the shortage of barrels, accentuated by long delayed railway transport, seriously interfered with our large contracts, while the necessary formality of obtaining the requisite Government licences has curtailed our output in the direction of small sales. We anticipate, however, much useful work from this plant after the war.

BLUE WATER GAS ADMIXTURES.

We are being pressed by Government departments to produce a proportion of blue water gas where available, for admixture with our coal gas, on the ground of coal economy. While it is obvious that this admixture will effect an economy in coal consumed in gas-works, it is questionable, having regard to the production of coke from the coal carbonized in gas-works, whether it will effect a general economy and leave more available fuel for consumption in the country.

I have been much interested in the question of adding blue water gas; and we have been doing so at Swansea for some considerable time. If only on the score of cost of production, the addition of blue water gas is worthy of the careful consideration of every engineer. I have been able to prove on more than one occasion that straight coal gas of 10,500 c.ft. per ton (South Wales coal) of 500 B.Th.U. gross calorific value is more costly to produce than a richer coal gas at a much lower make per ton, to which is added the combustible diluent blue water gas. Although the calorific value of both products is 500 B.Th.U. gross, it is beyond question that the mixed product is of greater service to the consumer than the straight coal gas—obviously owing to the higher flame temperature of the former and other characteristic distinctions.

The economy of the admixture will naturally vary in each works according to the type of carbonizing plant and the comparative net inclusive cost of labour and materials to produce the various qualities of coal gas and blue water gas. A further consideration, and not a financial one, is the question of coke, the production and sale of which will have a very large and important bearing on any decision as to what percentage of blue water gas can be added expediently.

GRADING AND WASHING OF COAL.

A very greatly increased percentage of inert matter in the coal has been sent out from the collieries during the war period, which increase could modestly and fairly be stated as an average of 10 p.ct. We have all found on complaining to the collieries that the men are blamed; but, whoever may be to blame, a speedy remedy is imperative. Various authorities have dealt with the extra haulage, power, and labour involved in handling this additional inert matter in coal. The figures are stupendous. There appears to be no insurmountable reason why this vital reform cannot be effected by an Act of Parliament providing that all coal

should be washed and graded at the colliery so as to contain not more than a specified maximum amount of inert matter.

HOUSEHOLD FUEL AND LIGHTING ORDER, 1918.

The importance of coal, of which we hear so much now in the Daily Press, is no new thing to gas undertakings, although the general public are only now being made to realize the necessity for economy. Press reports from various parts of the country upon the forms returned by consumers stating their requirements are conflicting; but no doubt at least six months must elapse before each householder has settled in his own mind the subdivision of fuel which best suits his own particular requirements. From a brief examination of the possible effect of the Order upon total gas consumptions, a decrease is apparently inevitable. In some cases this decrease may be deferred even until next spring; but it has still to be faced. This conclusion is arrived at by assuming that an average consumer with a cooker and (say) one fire, which he has been in the habit of using freely but not extravagantly, finds that if he applies to be allotted his usual amount of gas he is left with a rationed quantity of coal very much less than he considers he requires. Gas being more amenable to control than coal, he cuts down his gas allowance to suit his coal requirements. If this argument is proved in actual practice, then those undertakings that have a relatively large proportion of gas-consuming appliances per consumer in their districts, or who have systematically and effectively developed their gas sales, will suffer the greatest decrease. One effect of the Order, however, will undoubtedly be to draw householders' attention to the coal economy value of gas as no private publicity campaign could have done.

As gas managers, it is our duty to assist in whatever capacity in carrying out the spirit and meaning of the Order, and at the same time, in the interests of our industry, to foster and develop the propaganda work for the conservation of coal by the more general use of gas in the household. The public must feel that we are an ever ready and important service, and that any voluntary curtailment in their consumption is not due to us, but to the temporary operations of the Order.

REFORM AND RE-CONSTRUCTION IN THE GAS INDUSTRY.

The war has disclosed many weak points in our national and commercial life, and has been the means of bringing much-needed economies—as in the case of food and fuel—into operation, together with the obvious revision of many of our commercial methods. While younger industries have been able to conform to the altered conditions, the gas industry is still bound up in precedents and antiquated legislation, from which it is necessary to permanently free itself if it is to be maintained in a healthy and staple condition for the future.

We appear, unfortunately, to suffer from two principal disabilities—first, the lack of appreciation by the general public for the services we render, due largely, I feel sure, to an inadequate knowledge of the subject; secondly, to the grandmotherly method of legislation, wherein it is possible for captious local authorities, often themselves owning the competitive electricity undertakings, to appear and misrepresent gas consumers by endeavouring to impose on gas suppliers vexatious restrictions which benefit no one. Conditions for the present and for the future have so altered that legislation should at once be set up to secure the permanent stability of gas undertakings; utilize fully the gas industry as a national asset; maintain for gas consumers the maximum efficiency of gas service; and generally allow gas undertakings more scope for development on commercial lines.

It is abundantly clear that the electrical industry is leaving no stone unturned to push and make the most of their present exceptional opportunities. One instance will suffice. In July, 1916, the Coal Conservation Committee was appointed; and one of the items of reference was:

> To consider and advise what improvements can be effected in the present methods of using coal for the production of power, light, and heat, and of recovering bye-products, with a view to ensure the greatest possible economy in production and the most advantageous use of the coal substance.

The Committee appointed five Sub-Committees, two of which (the Power Generation and Transmission Sub-Committee and the Carbonization Sub-Committee) evidently dealt with the terms of reference quoted above. What was the result? The latter Sub-Committee report dealt with the pioneers of the "constructive" distillation of coal, the gas industry (whose engineers and managers make a scientific profession of coal economy), in a few meagre lines which tail-off by leaving the matter to the Fuel Research Board. And even this is buried in the voluminous final report of the Coal Conservation Committee just published. Compare this with the flamboyant report of the Power Generation and Transmission Sub-Committee—which was made public some time ago in the Press throughout the country—advocating electricity for everything and everybody.

As an alternative to the recommendation of this Sub-Committee, of which you are well aware, a proposal to subsidize extensions to existing gas-works in every town, enabling them, among other things, to supply gas power to the local electricity undertakings and all industries, would undoubtedly be of more general economic value. Some such suggestion might commend itself for the consideration of the much-needed Committee on Gas Reform. If the Premier were to give the gas industry one of his apt expressions on the subject, it would not be "Hold Fast," but "Get Moving."

DISTRICT ASSOCIATIONS.

The commercial or business sections of the District Associations have amply proved their existence during recent years, and, if organized collectively, could be made a powerful factor to the advantage of the gas industry. It is obvious that views are more freely expressed, and one generally comes into closer touch with actualities at District Association meetings than it is possible to do at representative meetings held in London dealing with general subjects. It appears desirable that a movement should be made to combine the views of the Commercial Associations by periodical meetings of the Associations. I am not inclined to advocate that the combined Associations should carry on any executive work, as this important matter is already being well provided for by the National Gas Council, which must be given full credit for the enormous work shouldered by them to uphold the gas interests during the most trying period ever experienced in the history of the industry. I do, however, suggest that the Commercial Sections of the District Associations be organized to enable them to voice their opinions—which, after all, will be the opinion of the gas industry and not of a few individuals—and give no uncertain mandates, which can be dealt with by the organization of the National Gas Council.

In my brief observations I have merely dealt with a few of the matters which are uppermost in our minds to day. But our anxieties to carry on through the coming winter are no less real; and I can only remind you that, in the faithful performance of your duties, each may be regarded as a small, but unromantic, part of the great war machine operating infallibly for our national and commercial freedom.

Mr. H. D. Madden (Cardiff) said he had been asked to propose a hearty vote of thanks to the President for his address Mr. Clarry and himself had been associated together in the gas industry for very many years—first when the President went to London to learn the profession of gas engineering, and again during recent years since he had come back to South Wales. He knew how keen he then was on his work; and the address showed that he was still keener now. From his address, he seemed to have seen beforehand the policy of reconstruction; and he (the speaker) was aware that in their own Council meetings the President's view had been that they should get ready for this reconstruction period. He clearly showed by his address that he had grasped all those particulars and essentials that were so necessary when the time came—and it was upon them now—to get ready for this period. One of the biggest of their problems the President had briefly touched upon, and that was the production of a fuel that was most suitable for everybody. When this was solved, they would be able to go ahead. After listening to the address, they would all feel satisfied that the interests of the Institution during the coming year were going to be in very good hands—and not only in good hands, but in progressive hands.

Mr. Mogford seconded the vote; remarking that Mr. Clarry had dealt thoroughly with the whole of the gas industry, both from a technical and a commercial point of view; and the address gave promise of a very prosperous year. They would all need to do as Lord Moulton had suggested—each pull his own weight in the boat; and he was sure, with Mr. Clarry as stroke, their boat would get along well, The President mentioned that their industry had not had the support which it should have had from the Government. They all felt this very keenly. Government Departments had rationed this and fixed the price of that; and they had done it to the detriment of the gas industry. His own opinion was that, in dealing with Government Departments, the result depended very much on what was asked for, and the way one asked for it; and he felt that the gas industry had not been represented before these departments as it should have been. It might be the fault of the industry or of some one else; but it seemed to him that it was useless for them to complain. They all knew the old saying, "Heaven helps him who helps himself." Now, it was up to the gas industry—instead of complaining of the facilities and benefits their rivals had derived, by seeking for them, pressing for them, and insisting upon getting them—to see if they could not get ahead of their rival, or, at all events, get alongside of him.

The President, in response, said the assurance that he had pleased them was ample award for any trouble he might have taken in the matter of the address.

The Special Purposes Section.

The eighth annual report of the Special Purposes Section, which was next submitted, stated that there was now a total membership of 31, and during the year ten meetings were held, at which a great diversity of matters were discussed. One of the questions was "Reform," as to which the following resolution was unanimously passed:

> In consequence of the phenomenal developments brought about by the war, it is obvious that numerous drastic reforms are immediately imperative in matters appertaining to the gas industry. With the object of having the subject exhaustively considered and dealt with, this Institution of Gas Engineers and Managers requests the National Gas Council to strongly urge the President of the Board of Trade to at once appoint an independent Committee of the leading men of the country connected with the various branches of the gas industry. That this Committee be instructed to hear the considered evidence to be laid before them by the National Gas Council, the Institution of Gas Engineers, the British Commercial Gas Association, the Gas Companies' Protection Association, the various District Associations, and the Society of British Gas Industries. Further, that this Committee at the earliest moment recommend to the Board of Trade a definite and comprehensive policy to secure the stability of gas undertakings for the future, utilize fully the gas industry as a national asset, and maintain for gas consumers a maximum efficiency of gas service.

The receipts for the year amounted to £38 17s., and the payments to £59 18s. 10d., showing a deficit of £21 1s. 10d.; and after deducting the balance of 7s. 9d. in the hands of the Treasurer, there remains a deficit of £20 14s. 1d. Owing to the increased expenditure, the section recommended that Rule 2 be altered to read as follows:

> Membership of the section shall be open to any gas undertaking whose engineer and manager is a member of the Institution, on payment to the Hon. Treasurer of the Institution of the sum of 10s. 6d. in the case of undertakings whose make is below 10 million c.ft. per annum, £1 1s. in the case of undertakings whose make is 10 million and below 50 million c.ft. per annum, and £1 11s. 6d. in the case of undertakings whose make of gas is 50 million c.ft. and upwards per annum.

Mr. T. H. HAZELL (Newport) said he wished first of all to add his testimony to the excellence of the address to which they had just listened. It was one of the best he had heard delivered to the members of the Institution, and gave undoubted indication of great thought and research. With regard to the report for the past year of the Special Purposes Section, it would be seen that they had had to deal with a very wide range of subjects—and subjects of perhaps greater importance than ever before. It was gratifying to know that one problem at any rate was easing to the advantage of the industry. He mentioned this particularly, because they at Newport had felt it exceedingly hard that, in spite of the establishment of the so-called Coal and Coke Supply Committee at Cardiff, while every facility had been accorded for getting good prices for coal, and so on, they had done nothing so far as helping the gas industry to get rid of their coke accumulations was concerned. They had had to put up with growing stocks and very low, inadequate prices; but the time had now come, and they were all glad to see it, when there was a perceptible increase in the sales, and prices were stiffening so as to bear some nearer relation to the rates for coal. However, the main question dealt with in the report, from his point of view, was the position of the industry financially. They knew that it was suddenly discovered by the powers that be that the products of the gas industry were not only valuable but absolutely necessary for the Munitions Department, if Britain was to carry on the war successfully; and they therefore called upon the industry to do its utmost to provide them with the material for high explosives. How this call was met, all the members knew. The industry applied itself earnestly and patriotically to supplying what was needed, and found that, under all the conditions imposed, they were doing it at a financial disadvantage. As time went on, this disadvantage increased to such an extent that they had to ask for some relief—some way of meeting the costs they were put to, as the result of the high price of coal and the low rates they were receiving for their products. The appeal became so strong that the Government saw the necessity of inquiring into the state of affairs. They all knew what happened. A Parliamentary Committee were appointed to look into things. After hearing an immense amount of evidence, their deliberate report was that the gas industry had done excellently in the provision of what was required, and also that they had suffered financially to a very great extent on account of the rise in coal prices and wages. Having suffered exceedingly in this respect, they deserved to have some consideration; and for all their patriotic services, the Committee decided to recommend that they should be put on "half pay." Such a decision undoubtedly was pure stultification. No one who read the actual report submitted could come to any other conclusion. Fortunately, there were in Parliament friends of gas undertakings, who said that it was a very mean proposal indeed to follow on such a finding; and the "half pay" was increased to "three-quarter pay." And that was supposed to be, at this time, sufficient satisfaction for the gas industry for what they had done for their country in the hour of need. At the same time, the official appointed by the Ministry to deal with the coal industry, seeing that their profits were likely to suffer some little reduction, with three strokes of the pen had added such a sum to the price of coal as should maintain the coal proprietor in the receipt of, as he thought, an adequate return in the shape of profits. Now, if the coal owner had done patriotic service for his country, the gas undertakings had done at least twice as much; and he was not sure that he was altogether in agreement with the methods by which it was sought to relieve the financial hardships of these concerns. It was all very well to put a certain proportion upon the user of gas, to increase his price adequately for what he got; but there was something to be said in the direction of asking the Government to pay for all that they obtained from the gas undertakings. ["Hear, hear."] Why should the Government not make adequate payment for the immense sacrifices and the great supplies which had been given to them by gas undertakings, and so to a certain extent ease the burden that they proposed should be put upon the gas consumer? In conclusion, he should like to draw their attention to the position revealed by the accounts of the section. To meet the deficit, it was suggested that the rules should be altered, as set out in the report; and he had only to say in regard to this that it was undoubtedly a necessary move. The work of the section during the past year had been of exceptional value; and if everybody in the district covered by the Institution knew and appreciated the full value to the whole industry of what was being done, there would not be a single undertaking left out of membership. It was to be hoped that something would be done to bring in the few who remained outside; for undoubtedly those who belonged to the section were all the better for their connection with it. He moved that the report and accounts be adopted.

Mr. H. BARKER (Llanelly), seconding, remarked that on first glancing at the report, it might look as though everything had gone wrong; but this was not to say that they had not tried. They had tried, and tried hard; and he believed that the feeling of the members was that they should still go on pegging away.

The motion was agreed to.

THE RECONSTITUTION SCHEME.

The PRESIDENT remarked that a development had occurred in connection with the scheme for the reconstitution of the National Gas Council. Mr. Mogford had been through the points, and would like just to say a few words on the matter while they were all together.

Mr. MOGFORD said that no doubt those who had seen the "GAS JOURNAL" that morning were conversant with the fact that the National Gas Council had a definite scheme of reconstitution; and it would be necessary for them to discuss the proposals at an early date, as they would affect the Commercial Section very seriously. The general proposal, he took it, was that the National Gas Council should have District Committees, covering the areas now represented by the different District Associations, and that these District Committees should elect representatives, who would constitute the National Gas Council. If these District Committees were going to be formed, it would practically do away with their Commercial Section; and he thought that it would be wise to hold a meeting as soon as possible to discuss the whole subject. They could not very well consider the matter now, because they were not fully acquainted with the proposals; but if it was practicable to have a meeting before that of the Institution in London, it would be a very good thing.

REPRESENTATIVE ON THE COUNCIL OF THE INSTITUTION OF GAS ENGINEERS.

Mr. A. J. BOND (Aberavon) said it was their usual practice that the retiring President should be chosen as their representative on the Council of the Institution of Gas Engineers; and in appointing Mr. Mogford they would have a gentleman who possessed the necessary energy, as well as the courage of his convictions, to put forward any claims that might be desirable on their behalf.

Mr. ANDREWS seconded this, and it was agreed to.

Leakage and Main-Testing.

The PRESIDENT said they now came to the paper. It was decided some time ago that for the future papers should be circulated before the meeting, with the object of giving members an opportunity of carefully going through them, and preparing to discuss them at the meeting. It was hoped that in this way they would get a better all-round discussion. There were some people who liked to have a little time to think over what they were going to say.

Mr. F. SHEWRING (Pontardawe) then submitted a paper (which it had been arranged, having previously been circulated, should not be read at the meeting) on "Leakage and Main Testing." It will be found, with the subsequent discussion, on p. 126.

Mr. W. C. JACKSON (Neath), in proposing a vote of thanks to the author, said there was no doubt that leakage was a financial difficulty which had to be faced at the present time. It meant money; and therefore they must fight it.

Mr. REES seconded, and remarked that high prices meant high costs, and though they might pat themselves on the back over high makes, the matter that counted at the end of the year was the sale per ton. The question of leakage was therefore of paramount importance—particularly at the present juncture. They would be glad at an early date to have some of the author's further experiences in the matter.

Mr. SHEWRING said the question of leakage was of national importance now; for if the gas wasted on the distribution system could be materially reduced, it would lessen the coal requirements in the retort-house. They should do all they could to conserve the coal supplies; and the systematic testing of mains and services on the lines he had laid down would be a means to this end.

A VOTE OF THANKS.

Mr. J. P. JONES (Caerphilly) proposed a vote of thanks to the Swansea Gas Company for having provided the room in which they were holding the meeting. Reverting to the President's address, he considered this a statesmanlike review of the position of the gas industry at the present moment. He did not know whether there was anything in environment; but certain it was that not only was the room suitable to the subject-matter, but the subject-matter was equally suitable for the room in which it was delivered. There was a ring of sincerity on the President's part which must appeal to them all.

Mr. J. ROBB (Chepstow) seconded the vote, which was passed.

PLACE OF NEXT MEETING.

It was agreed that the fixing of the place of the next meeting should be left to the Council.

This concluded the business of the meeting.

Luncheon and Afterwards.

The members then proceeded to the Hotel Metropole, where they sat down to luncheon, on the invitation of the Chairman and Directors of the Swansea Gas Company. In the absence through illness of the Chairman (Mr. John Glasbrook), this function was to have been presided over by Mr. Rees (the Deputy-Chairman). As it was, Mr. George Andrews (as Senior Director) occupied the chair. The sudden death of Mr. Rees, which occurred at Bettws-y-Coed on the morning previous to the meeting, naturally cast a shadow over the proceedings; and it was fittingly decided, in the circumstances, that the luncheon should not be followed by any speech-making—the toast of "The King" being the only one submitted.

The afternoon was spent at the gas-works; but on the way there, a pause was made in order to inspect the well-appointed and centrally-situated showroom of the Company, an illustrated description of which will be found on p. 226 of Vol. CXXVII. of the "JOURNAL." The beauty of the fittings that are tastefully displayed in the show-room is proof of good judgment, and it is also, be it remembered, at the same time a delicate compliment to the gas consumers of Swansea, whose tastes the Gas Company set themselves to consider. Among the usual accompaniments of a show-room—all nicely displayed, without any overcrowding—one device in particular attracted attention. This was the "Matchless Gas-Stove Lighter," of which the Company have already fitted a large number. One end of a piece of rubber piping is attached to the top-rail of the stove, and at the other end is a thin brass tube with a weighted

mushroom-valve inside. When the tube is held in a perpendicular position (for which purpose, when not in use, a fitting is provided) the valve closes, but it is arranged so as to permit enough gas to pass to form a miniature bye-pass. When the lighter is held at a downward angle, the valve drops and allows a full flow of gas to pass through for lighting the stove-burners. There is a tap for shutting-off when the lighter is not in use.

But it is not necessary to enter the show-room to become interested. The windows also appeal to the passer-by—particularly the one in which are shown the products of a ton of coal as treated at the Swansea Gas-Works. Above these specimens is the statement that, in addition to the large quantity of gas that is available throughout the district for light, heat, and power, there are: Screened coke, about 9 cwt.; through breeze, about 2 cwt.; tar, about 8 gallons (dehydrated); sulphate of ammonia (a valuable agricultural fertilizer), about 15 lbs.; light oils (used exclusively in the manufacture of dyes, chemicals, and medicines), about 1½ gallons; and benzol (of the utmost national importance for making high explosives), about ½ gallon.

From what has been said, it will be judged that, apart from the sales of fittings, the taking-in of gas accounts, &c., much valuable work has been carried out through the medium of the show-rooms, by bringing to the notice of the public economies, both individual and national, to be secured by the use of gas.

At the Gas-Works.

During the inspection of the gas-works (to which additional interest was given by the Presidential Address earlier in the day), the members were in charge of Mr. Clarry, and the Assistant Engineer (Mr. Ablett); and, at its conclusion, a full day's proceedings was brought to a close by tea in the Board-room. Some day, no doubt, the members will return to Swansea to see a new works, which a few years ago it was decided to build on a fresh site, at Morriston, some five miles distant from the present ones. In addition to the preparation of plans and estimates, a considerable amount of work in the way of making roads, laying the drainage culverts, filling-up, &c., had been done when the war broke out, and necessitated the postponement of further operations until the return of peace. The growth of the Company has, it may be remarked, been particularly rapid; the make of gas having increased 112 p.ct. within the last ten years, to the present figure of 650 million c.ft. These ever-increasing demands have, of course, called for various extensions from time to time, until at last an entirely new works was resolved upon.

Coal is received into the works in trucks on the Company's private siding. The elevators are in duplicate, and are connected with necessary longitudinal and traverse conveyors, to conduct the coal into the storage hoppers on both sides of the retort-house. These hoppers have a capacity of 750 tons. The present retort-house, with its semi-circular corrugated sheet-iron roof, was erected in 1902, and contains 24 beds of inclined retorts, each bed having eight retorts of 24 in. by 15 in. section, and 20 ft. long, capable of taking a charge of 7 cwt. for a six-hour charge. Of these 24 beds, thirteen are provided with step-grate furnaces, and twelve are fitted with Brooke's patent air-regulators on both the primary and secondary air-inlets. The remaining bed was, as an experiment, fitted-up with specially large retorts, so tapered as to take full charges. No decision as yet has been arrived at; and the experiment is proceeding.

There are water-cooled and atmospheric condensers, the connections to which permit of the gas being passed through each in either one or two streams. The carburetted water-gas plant, which was erected in 1895, originally comprised four sets, each capable of producing approximately 400,000 c.ft. of gas per day. In 1916 the fifth set, of a capacity of 1,250,000 c.ft. per day, was installed; and at this time the old belt-driven fans were displaced by modern turbine blowers. In connection with this plant, there are two oil reservoirs, to contain a total quantity of 300,000 gallons of oil. To provide sufficient steam for the new carburetted water-gas set, and also to displace two or three separate steam-raising units which were burning coke, a central boiler plant suitable for consuming coke breeze was put in. Lack of ground space made the choice of a site difficult; and finally it was necessary to put the boilers over the underground tar and liquor well, after having laid a cantilever ferro-concrete foundation slab, resting on the side-walls of the tank, and counterbalanced by the foundations for the economizers and chimney-stack.

On leaving the exhausters, the gas passes through a Livesey washer; and from there it goes to two tower-scrubbers, and on to a rotary washer-scrubber, which is used as an oil-washer for crude benzol extraction. In order to obtain some rough idea of the extent to which oil-washing was depriving the gas of its illuminants, connections from the inlet and outlet of the oil-washer were led into the exhauster-house. A third connection nearer to the inlet of the purifiers was also made, so as to give a final result should it at any time be found necessary to partly bye-pass the oil-washer.

There are two purifier-houses, both having overhead purifiers with oxide elevators and conveyors. The purifiers in one house have the ordinary water-lutes; but those in the other house are luteless. Connections to these purifiers permit of the gas being divided into one, two, or three streams. Both houses are lighted by electricity, produced on the works by a small generator driven by a high-speed two-cylinder vertical gas-engine.

The two station-meters are capable of passing 60,000 c.ft. of gas per hour; and there are three holders, having a total storage of 2 million c.ft. The Swansea area is divided into four districts, and has its own particular governor. There is a Parkinson steam-heated vaporizer, the oil used in which has latterly been "Solvene" from Messrs. Brotherton & Co. The sulphate of ammonia plant consists of two saturators with stills capable of producing 1½ tons per day.

On leaving the retorts, the coke is mechanically transported by conveyors and elevators to overhead coke storage-hoppers, from which easy loading into either wagons or carts is obtained. Cookers are cleaned by means of a caustic bath, and are repaired by the Company's own men. Prior to the war, and in conjunction with the general scheme of extensions, a central gallery stores was decided upon; but this proposal has had to be replaced by a temporary arrangement. There are three assistants in the laboratory, carrying out various works' analyses necessary to regulate and obtain efficient working of all the plant.

LEAKAGE AND THE TESTING OF MAINS.

By Frederick Shewring, of Pontardawe.

[A Paper read before the Wales and Monmouthshire District Institution of Gas Engineers and Managers, Oct. 9.]

Within the confines of our Association there are a number of gas-works where the leakage or unaccounted-for gas figure is exceedingly high. In fact, in some instances, if the loss could be reduced to (say) 10 p.ct.—which figure would be considered high for many undertakings—the financial condition of the concerns would be considerably strengthened; and in other cases, if the difference referred to could be recorded as gas sold, the improved finances would warrant the payment of an additional dividend of fully 4 or 5 p.ct. It is having regard to these circumstances that I present this paper on leakage.

On the works, leaking gasholders, valves, connections, and blowing holders assist to swell the unaccounted-for leakage; but it is the distribution system upon which I wish to touch. There are conditions in some localities which operate against a low leakage figure; and these are outside the control of the management. Briefly, they are as follows:

(1) Varied and high altitudes of the district supplied.
(2) Small mains, which require abnormal pressure to deliver the quantity of gas.
(3) Absence of a night and early morning load, which will often account for a higher pressure on the district—depending upon the altitude.
(4) Sinking areas. Mains laid on embankments or on the side of the mountains.
(5) Shallow laid mains now subject to heavy vehicular traffic. Mains and services laid in subsoil injurious to the metal, and services laid with little regard to exterior corrosion.

To deal with these headings separately is outside the scope of this paper; but I should like to give the results of an investigation of the cause of increased pressure on a district at one time under my control. Cycling through the town in the early hours of the morning, I noticed that all the bye-pass lights in the public lamps were unduly large. It was not always so. Care had generally been exercised to prevent waste in this direction. The matter was at once looked into; and upon successive nights recording pressure registers were fixed on the district and at the works governor outlet.

The excessive pressure was attibuted to the following circumstances: The midnight and early morning load varied, owing to local works only working certain nights of the week. When these works were closed-down, the gas requirements of the town were very small. The station governor, although set to give 20-10ths pressure, failed to govern the quantity of gas distributed in these circumstances. The gasholder pressure being fairly high, the inlet governor pressure gradually crept through to the district. This shows that, under the conditions then operating, the governor was not governing the pressure, because the volume of gas permitted to pass the governor was more than that passing away on the district.

The action of the cones of governors is to reduce the gas orifice as the demand for gas decreases. But it must be remembered that a governor will not act entirely as a shut-off valve. Thus it happened that the pressure on the district was high—varying in accordance with the altitude. It is possible to remedy (at all events minimize) the above-mentioned conditions. A night load, therefore, assists to keep down the average pressure on the district, and incidentally the unaccounted-for gas figure. Assuming that some of the adverse conditions referred to especially apply to our own districts, we may question ourselves as to the extent to which they influence our annual loss of gas.

Passing on, the question of finding a remedy suggests itself. My reply to this question is, The periodical testing of mains and services by test-meter registration is the most reliable method to locate loss of gas. Having discovered and overhauled a defective length of main, the result of the work can readily be monetarily calculated. The initial outlay and the trouble taken are invariably well repaid. On districts developing leakage, I consider this to be the only safe method by which leakage can be kept within reasonable limits.

Mapping-Out the District for Testing.

Straggling districts of supply dependent upon a single line of main are less convenient for testing, because there is no circuit

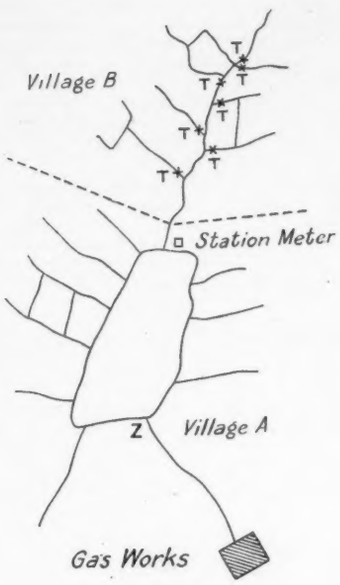


Fig. 1.

of mains to ensure the supply of gas being maintained on the remainder of the district when a section of the trunk line is under test. In Village B (fig. 1), I should first of all test all side streets at the points marked T, before commencing on the trunk main. When the trunk main is started upon, the results of side-street tests taken in each successive length of main under test have to be deducted from the registered loss of gas. It is obvious that after a few tests on the main line have been carried out, the consumers' taps to be turned off become numerous, and entail the employment of a number of men. When the area gets too large to treat in this way, two test-meters can be used. The gas registered by the second meter must be deducted from the first to obtain the loss on the isolated section—see fig. 2. Before taking tests of this sort, consideration must be given to the possible requirements for gas in the district during the time of test; so that meters of ample size may be employed.

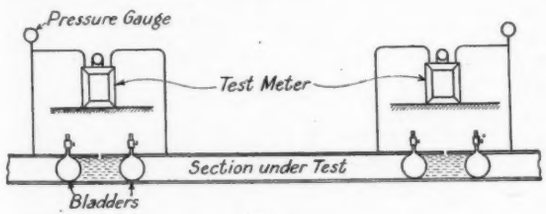


Fig. 2.

In Village A the whole of the mains with the exception of the length from the gas-works to point *Z* can, with a little thought, be conveniently arranged for testing.

The desirability of installing a station meter in areas such as Village B was raised by my Chairman some few years ago. By registering the whole of the gas to the village and deducting the consumption, the actual loss is known. The idea has much to commend it; for by noting the daily amount of gas passing to the village, information is readily obtained, and any abnormal registration would suggest leakage developing from sundry causes. As far as I know, the only practical point which would affect the supply would be the loss of pressure required to work the meter. This may amount to ½-inch. But the altitude (irregular or otherwise) of the area in question, the size of the mains, and the available pressure at the works are all details which call for consideration on the spot.

District valves are often found useful when main-testing; but they must never be regarded as tight. Insert bladders in the main about 12 in. from the valve, and fill the intervening space with water, to ensure tightness. If a careful record is not kept of district valves, and information as to whether they are right or left hand, difficulties are apt to follow. Some years ago, after the expenditure of much time, I traced the trouble of defective supply on a district to a buried valve which was found closed. I had no idea such a valve was in existence.

An important factor in reducing leakage is to narrow-down the area susceptible to defects. This is only possible by systematic testing of mains and services.

Some Practical Considerations.

There are a few preliminaries which are of importance, and call for care, in the efficient testing of mains. A liberal amount of enthusiasm on the part of the engineer or manager is helpful in obtaining a good start. If this enthusiasm is also awakened in the men chosen for the work, better results are sure to follow. The foreman in charge must have an aptitude for observing and carrying out important details. If he has had the right sort of training, and considerable practice in this class of work, he should already possess the necessary qualifications. It is surprising how very few men selected from the ranks of gasfitters and main-layers are really suitable for main-testing, unless they are under constant supervision.

The shutting-off of consumers' main taps, and at the same time observing if they are leaking, the closing of public lamp cocks, the examination of plugs on syphon stand-pipes, are all apparently insignificant details; yet they are of paramount importance if the test of a section of main is to be of any real value. The test meter should be occasionally tested for accuracy. I prefer animal bladders for mains up to 6 in.; and sometimes 8 in. mains can be treated in this way, if a supply of large bladders is obtainable. Pigs' or bullocks' bladders are the best; and they should be worked into shape, having regard to their requirements. If a small puncture takes place when testing, and no bladders are available, the damaged one can be made tight by inserting a pea or very small marble in the hole, and tying with tape at the top and the bottom. Bladders, including several spare ones, should be inflated and tested in water before being placed in the gas-main. The point where the brass tubing enters the bladder, and the taps also, call for careful testing with soap solution.

The usual method of isolating a section of main is to insert a bladder, and if it remains tight to assume it is in order. Some prefer to drill a larger hole and insert two bladders, leaving a space between them which is afterwards filled with water. I do not like this method when animal bladders are used. I prefer dealing with it as shown in fig. 3. Three holes are drilled, two for bladders and one in the middle for water. This way certainly entails more labour; but experience has taught me that it is a much more reliable way. In steel mains especially, sharp burrs

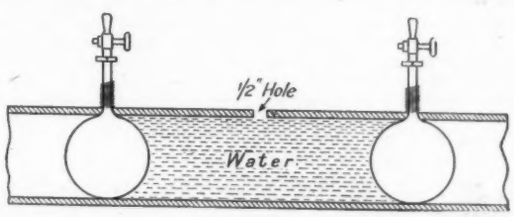


Fig. 3.

are formed where the holes have been drilled, and these will puncture the bladders if they are not removed. After the two bladders are inserted, water is poured in to fill the intervening space. By watching the level of the water, it is observed if the bladders are effectually isolating the section of the main. Time should not be wasted by adopting the quick method of using single bladders. When the test-meter taps are opened, all joints on the meter connections, bladders, tubing, and taps should be again tested for soundness with soap solution.

The gas passing through the test-meter per minute should be recorded for a period of about twenty minutes. If during this time the registration is regular, and everything is apparently in order, the record should be totalled up, and the average taken to show the loss of gas per minute. If results are erratic, bladders may be leaking or the gas may be turned on in some of the houses in the area under test. If there is any doubt about the accuracy of the test, it should be repeated again and again until satisfaction is attained.

The following table shows particulars of actual tests recorded before and after overhauling:

Situation.	Size of Main.	Pressure.	Time per C.Ft. Loss.	Loss per Hour.	Loss per Day.	Loss per Annum.
	In.	Tenths.	Min. Sec.	C.Ft.	C.Ft.	C.Ft.
(1) Graig Road .	3	30	1 46	34	814	297,000
(2) Graig Road .	3	30	9 43	6·2	148	52,000
Saving per annum, c.ft.						245,000

No smell of gas in this roadway had been detected by our staff, who occasionally pass that way, neither was any report received from the public; yet the loss of gas was considerable.

In locating escapes, bar-holes are made on the line of main every few feet, and a Short leakage indicator used to denote the presence of gas. Unless the exact line of main is known, it is far better to open the ground at two or more places to find its position than to start barring haphazard. This summer, after barring a length of main there was still a recorded loss of 20 c.ft. per hour; and the track where the workmen had barred was found to be about 6 ft. off the line of main. The second examination revealed the greater portion of the leakage. Services leading from the main to the meter connection should also be examined. Bends of roads are points where bad joints and careless workmanship are often found.

After a section has been overhauled, and if on re-testing there remains an undue loss of gas, it will invariably be found that, by subdividing the section, the defects will be more readily located. The area of defect will thus be narrowed-down. I prefer to carry out tests of mains in the afternoons, as less inconvenience will be

caused to consumers at that time of the day in residential districts. Night testing may at times reveal a large amount of gas passing in a certain area; but whether it is lost or used is problematical. The result may furnish a guide to further testing, and, in fact, may point to a bad portion in the district; but I always accept the figures of night testing with some reserve.

Some Other Points.

The higher the pressure at which gas is passed through consumers' meters the greater the tendency for loss to occur to the gas undertaking. Consumers' meters may also be working slow; and the condensation found in syphons has a bearing upon the unaccounted-for gas figure. Still, there is much leeway to make up before we can satisfy ourselves that the above-mentioned causes account for the greater part of our unaccounted-for gas. The older mains are now subjected to a pressure of about 100 p.ct. more than they were originally intended to withstand. The tendency to-day is also to increase the pressure load in mains; hence the necessity of examination on the lines indicated. When main-testing, much can be learnt about the district and the consumers' requirements which would not be ordinarily forthcoming

A point to remember is that there is a difference between a reduction in the percentage of unaccounted-for gas and a reduction of the actual loss of gas per annum. The former may take place, and would call for no effort on the part of the management; but the latter case more often shows that steady work has been expended upon the district.

In conclusion, I may add that I have purposely avoided side-tracking of the subject. Much could have been said about the class of mains, joints, connections, &c., but to deal thoroughly with these questions would have extended the paper beyond what may be termed orthodox in these days of paper shortage.

Discussion.

Mr. W. C. Jackson (Neath) said the question of leakage was of vast importance—particularly in these days, when the cost of manufacture was so high, owing to the price of coal and labour. So far as the works were concerned, it ought to be possible to eliminate leakage altogether. The general source of loss on the works was usually wastage, as often the methods of lighting were crude and wasteful, and gas was left burning, unless a careful check was kept. At Neath, he had had check meters put in at each of the shops, boiler-house, retort-house, &c.; and by checking the consumption personally each week, the annual consumption at the works had been reduced by over half-a-million cubic feet. He simply drew attention to this matter of wastage, as it had the same bearing upon the financial side as leakage. Reverting to the paper, Mr. Shewring had in his five points included the most important factors of leakage. But there was another which he would mention—namely, bad workmanship in the laying of mains and services. Unless keen supervision had been kept upon this class of work, a very fruitful source of leakage was brought about. In quite a number of works at the present time, the only way of testing joints when main and service laying was to try the joint with a lighted torch—to his mind, a totally inadequate method. Every joint, after having been caulked-up, ought to be tested with soapsuds; and then, if found to be tight, a fillet of cement applied, or a thick coating of red lead paint. Another point was service-pipes as short as possible, so that leakage from this source was reduced to a minimum. He took up the attitude that all gas-mains should be fixed in the front part of the house—both on the point of economy and leakage. Mr. Shewring mentioned the case of excessive midnight pressure due to the station-governor passing more gas, even when set to give 20-10ths, with the result that the gasholder pressure to a certain extent was thrown upon the district. In numerous cases this could be rectified, as the trouble was often caused by a slight encrustation of naphthalene or dirt on the governor-valves, which prevented them from closing off sufficiently. In one works where this trouble showed itself from time to time, it was effectively got over by bye-passing the governor, and thoroughly cleaning the valve and valve-seats. He considered Mr. Shewring's method of cutting-off the gas as shown in fig. 3 to be the only practical one; and it should be adopted in every case. At one works with which he (the speaker) was connected, several forts were supplied through very long mains; and it was felt that considerable leakage was taking place. The result of a test in one particular case showed an annual leakage of three-quarters-of-a-million cubic feet of gas. The Company, after repeatedly writing to the authorities, fixed a meter close on to the Company's main, thereby charging for the whole of the gas actually passing. This, he might say, was very soon followed-up by the authorities in question thoroughly examining their service-main. Of course, this to an extent confirmed his views, that in such cases as shown in fig. 1 (Village B), a meter registering the whole of the gas consumed in the district would be of great advantage in ascertaining the extent of the leakage in the area. One other point mentioned by Mr. Shewring—and unfortunately very often neglected—was that of keeping careful records of the gas-mains in the district. Unless such records were kept, a considerable amount of labour was bound to be wasted in unnecessary opening of the ground. Such a record should be kept in two ways. First, the usual way of plotting the gas-mains upon a district map; and, secondly, by means of photographs of every main when laid, and a record of these kept in the mains photo. album. With these two records, it would be impossible to lose sight of the position of any main. The question of under-registration through defective meters must not be overlooked, as more gas was unaccounted for in this manner than most managers were aware of. It ought to be the practice in all works for gas-meters to be tested at least once every six years—apart from tests made in special cases, where a large decrease in consumption pointed to a defective meter. During the past three years, he himself had had 1890 meters tested; the results of the tests showing that 82 of these were registering between 4 and 10 p.ct. slow; 51 between 10 and 20 p.ct. slow; 15 between 20 and 50 p.ct. slow; and 547 between 50 p.c. and passing all gas unregistered.

Mr. H. D. Madden (Cardiff) said that, in regard to leakage and main testing, there were one or two matters he should like to bring to their notice as rather helpful in dealing with escapes. He thought much could be done by co-ordinating the reports that came in with reference to escapes. The syphon pumpers could intimate any sign of leakage. Then wherever ground was opened for services, he thought it was advisable to bar left and right, and make a test when the ground was open. The third suggestion was that they should keep in touch with the local sewer-men, and get them to report escapes. A leak would go more quickly to the sewer than anywhere else. Further, when openings were made by local authorities for other purposes, this afforded a very fine chance of testing the ground at that point, to see if there was any escape in the vicinity. There was a paper just coming before the Institution of Gas Engineers which would be found to have a great bearing on the subject they were considering; and it would be read by no one with greater interest than by Mr. Shewring. It was a paper on leakage and unaccounted-for gas. There was a great chasm between these two things; and the investigation which had been made was really an important one—especially at the present time, under the altered conditions of manufacture. Taken in conjunction with Mr. Shewring's paper, the other paper to which he had referred would be very helpful to the whole of the Institution.

Mr. George Andrews (Swansea) remarked that he had had a little practice in main testing, in connection with a good many miles of mains in Swansea; and he always thought the best thing to do was to keep the tapping of the mains down to as low a limit as possible. In other words, do not tap the main more than absolutely necessary. In looking at fig. 2, it seemed that the author had to make a good many holes in whatever length of main he desired to test. He thought, when one had a good long length of main to test, the shortest way would be to sever it at both ends, then cap, and test at (say) 30 in. water pressure. No doubt syphon men, if they were vigilant, would find an escape as soon as anybody; but, on the other hand, these men were often the cause of trouble themselves. When one had reports of leakage from a certain district, and went to the expense of sending out a gang of men, it was sometimes found that the syphon-pumper had been doing his duty very well, and had emptied what was in the syphon into the guttter, spreading a smell miles around.

Mr. Shewring, in reply, said the loss of gas on the works was a point which he strictly ruled out of his paper, as this was a matter of distribution. Mr. Jackson very rightly called attention to bad workmanship. This was their trouble, apart, of course, from the natural subsidence of the soils of their districts. This was what leakage and main testing was for—to cure bad workmanship. He quite agreed that a lighted torch was inadequate; and in general work, the soap-sud test was better than anything, with a good pressure on the district. He had tested work that had originally been tested with torches, and had found lots of escapes, which had revealed themselves by the use of soap-suds. It was, of course, a good plan to make the services as short as possible. As to the action of governors, certainly naphthalene or dirt deposited round the cones would accentuate the trouble to which he had referred in his paper; but a clean valve did not cure it. When there was very little gas being used in a district with a fairly large governor, the higher pressure from the holder leaked through the valve, because, as he said, these valves were not shut-off valves. The only possible way to overcome a difficulty like this would be by bringing into action a smaller governor. Mr. Jackson's idea of photographing mains when laid was very good. As to the tests he had quoted, he seemed to have had rather exceptional experience with slow meters and meters that had stopped. Mr. Madden had referred to the co-ordination of reports. Of course, on a small works one did not keep a man specially for the work of syphon-pumping; but one naturally endeavoured to get all the men employed by the undertaking to report escapes, as well as the consumers and the public generally. A little remuneration was helpful in bringing forward reports, but not always escapes. When a service was being put in, if there was an escape of gas in the vicinity it usually showed itself; but he quite agreed with Mr. Madden that if they could get main-layers to make an extra barring of the main, it would be a help. Mr. Andrews had raised rather a peculiar point. He objected to the tapping of the five holes as explained in the paper, but advised them to cut the main through, cap it at both ends, and then test it. Mr. Andrews would have to drill two holes to bladder the main; then capping it would make four; and two holes would be required for the meter—making six in all.

Mr. Andrews remarked that he did not mean to use a meter.

Mr. Shewring said, at any rate, there would be four. Instead of having five holes, he would have the main to cut through, and two caps and two holes. The only way to test a main when one did not use a meter was by putting it under a pressure test, and making a calculation based on the time the pressure-gauge took to fall and the area of the main. This was apt to be rather a difficult matter. One might have a main with a large number of services on it. He did not think there would be any saving at all in this way, unless there was not a meter handy.

Gas-Driven Lorries in Sydney (N.S.W.) Streets.—According to the "Sydney Evening News" of July 19, the first of the gas-driven lorries fitted up by the Australian Gaslight Company was that seen in commission in the streets of the city. It was remarked: "These lorries have been in use for some time in England, and are designed to supply the want caused by the shortage of benzene. By substituting gas direct instead of benzene as a motive power, it is claimed that a considerable saving in running is effected. In England the gas-driven vehicles have been brought to a high state of perfection; and a large number of them are now in use. Nevertheless, the application of the new idea is still in the early stages; and much remains to be done before perfection is reached. With regard to the introduction of gas-driven vehicles in New South Wales, the Government are anxious to have the new motive power adopted as widely as possible, owing to the scarcity of petrol."

THE CALORIFIC STANDARD FOR MANUFACTURED GAS IN CANADA.

By Arthur Hewitt, the General Manager of the Consumers' Gas Company of Toronto.

[A Paper read before the Canadian Gas Association, August, 1918.]

The events of the past four years have confirmed very emphatically the wisdom of the action taken by this Association, in connection with the adoption by the Government of a calorific standard for town gas in Canada; and while the industry has had to face almost unsurmountable difficulties, it is gratifying to find that we are still able to "carry on."

The tremendous rise in the cost of raw materials, repeated increases in the scale of wages demanded for labour, the burden of new and increased taxation, have been causes of anxiety to those engaged in an industry which is generally recognized as being one of the most important necessities of our modern civilization. But I suppose the greatest of our problems has been how to meet the unprecedented demand for gas. It would have been difficult in normal times to anticipate and provide for such increases as have been shown during the past two years; but with the prohibitive cost of new plant, and the impossibility of securing certain necessary classes of materials required in gas-works construction, the solving of this problem has necessitated the exercising of the utmost engineering skill, closest supervision, and constant and anxious thought on the part of those carrying the responsibility of maintaining an adequate supply of gas. That the industry has not failed to successfully meet this serious situation, is a source of satisfaction; and the members of the Association may well be proud of the achievement. The situation is not improving, however, nor are our difficulties decreasing. It therefore behoves us to take counsel together, in order that, by a more careful survey of the facts, and with a common knowledge of the conditions, we may endeavour to find some new line of activity which shall aid us in meeting the situation.

Recent experiences have reminded us that there is no finality to progress, that new problems are constantly presenting themselves, and that in the solving of these problems we always add to our knowledge of the gas business. When we asked the Government to set a standard of 500 B.Th.U. for town gas, we were very modest. But in their wisdom they decided on a standard of 520 B.Th.U. Experience has shown that there is economic waste in this standard; and now that there is a national necessity for conserving coal and gas oil, it is a matter of regret that the Government have not yet seen their way to so revise the Gas Act as to permit gas companies to manufacture and supply gas of a quality suited to present needs, having regard to the importance of restricting to the utmost practical limit the quantity of raw materials required in its manufacture. From the standpoint of the consumer, it would mean little or nothing if the standard for gas was fixed at (say) 460 or 470 B.Th.U.; while the saving of even a moderate amount of coal or gas oil would be a matter of national importance.

There is encouragement in the fact that both the United States Administration and the Government of Canada are looking into this matter; and I sincerely trust that they will act wisely and promptly in relieving gas undertakings of the necessity of continuing to meet the present uneconomical requirements.

It is interesting to review the progress which has been made in England, in the United States, and in Canada, in the matter of standards for manufactured gas. The subject was considered to be of such paramount importance in England that in the year 1900 Special Committees of the House of Commons and the House of Lords were appointed to take evidence and hear testimony for and against a change being made from the then almost universal standard of 16-candle power, as tested by a Sugg No. 1 argand burner; and it was not until about 1905 that any great progress had been made. It was not until 1911 that the Gas Light and Coke Company were empowered to manufacture and supply gas having a calorific value of not less than 500 B.Th.U. gross; and very recently, under certain conditions, gas companies operating in Great Britain have been permitted to distribute gas as low as 450 B.Th.U.

In the United States the first State Government to fix a calorific value for gas was the State of Wisconsin. This standard was 600 B.Th.U. A few years ago, a Joint Committee of the Government of the State of New York and representatives of the gas industry fixed upon a standard for New York State of 585 B.Th.U. As you are all aware, the Canadian Government in 1915 adopted a standard of 520 B.Th.U. gross; and in 1917 the Public Service Commission of the State of Massachusetts adopted a standard of 528 B.Th.U. I understand that the Fuel Administration of the United States is now engaged in obtaining data with a view to determining the quantity of gas oil per 1000 c.ft. and the quantity of gas coal per 1000 c.ft. which gas companies shall be allowed to use in the manufacture of their gas, and that these quantities will be based upon a gas of very much lower calorific value than that which has generally prevailed throughout the country.

It is possible that the question may arise as to whether a reduction in the calorific value of gas should carry with it a lowering of the price at which the gas should be sold. A suitable answer to this question will be found in the fact that the increases which gas companies have been called to meet in their operating expenses are tremendously greater than any increases which have been made in the selling price of their product; and unless they are relieved from the present necessity of continuing to meet the unnecessarily high standard of calorific value, they will be forced to make further, and very substantial, increases in the price of gas to their consumers. But even presuming what is not a fact—that gas companies would benefit financially by a lowering of the standard—it would still be true that the conservation of coal and gas oil would be a very great national advantage. It has been estimated that not less than 100,000 tons of coal would be saved annually in Canada; while the reduction in the quantity of gas oil required would be very large. As practically all of this coal and gas oil must be imported from the United States, and the cost of it paid for in American exchange, which is very high, there is not only the actual saving of material to be considered—but also the lessening of the amount of money leaving the country at a time when every dollar is needed at home.

Explosive Supplies and the Ministry of Munitions.

Reference has already been made to an article in the "Board of Trade Journal" on the supply of acids and fertilizers; and this has now been followed by another one on the Explosives Supply branch of the Ministry of Munitions—the branch which is charged with ensuring the supply of the other materials requisite for explosives production, the chief of which are glycerine, alcohol, and coal-tar derivatives. As to the last-named, restrictions have been placed on dealings in coal tar by Orders dated Oct. 1, 1917, and Jan. 1, 1918; the object being to obtain by distillation the maximum quantity of tar-oils for fuel for the Navy. The conditions laid down are summarized; but it is remarked that perfect control is almost impossible, owing to the very large number of tar-producers, which falls little short of 2000. Returns are, however, required from producers and from distillers; and the "receipts" of the latter are used to check the "despatches" of the former to distillers. Deliveries of tar by producers, under the heading of "otherwise disposed of," are also periodically checked against the issues of tar licences. Coal tar, of course, can be purchased only under licence, except (*a*) by a distiller for distilling down to pitch, or (*b*) in quantities not exceeding 10 gallons a week or 50 gallons a month. Pure and standard benzol and pure and commercial toluol became controlled at various dates during 1915, by direct contracts with the makers for their whole output of these products. But in one or two cases the Ministry of Munitions had to resort to requisition. By an Order that came into force twelve months ago, dealing is prohibited (except under licence) in crude benzol, crude naphtha, or light oils containing recoverable quantities of benzol or toluol. A licence has since January last been required to deal in crude solvent naphtha, solvent naphtha, and heavy naphtha.

Briquetting Small Coal.

A paper has been read before the Mining Institute of Scotland, by Mr. J. A. Yeadon, of Leeds, in which he dealt with the economy of briquetting small coal, and maintained (after forty years spent in the design, construction, and erection of briquette plants at home and abroad) that coal briquettes, when properly manufactured, possess numerous advantages. The calorific power of good quality briquettes was higher than that of the coal from which they were made, resulting from the addition of the pitch used as the agglomerant; briquettes thus produced were unaffected by exposure to the weather, and suffered less deterioration than the coal itself; briquettes produced from small coal could be made suitable for any purpose for which coal was ordinarily used for steam raising or heating—the one exception being for smelting in blast-furnaces; and under normal conditions, and with suitable and latest improved processes and machinery, any ordinary small coal could be converted into marketable briquettes, leaving a satisfactory profit to the makers. Discussing the relative merits of the ovoid and rectangular types of briquettes, Mr. Yeadon observed that the great advantage of the ovoid briquette was that the smallest sizes and the most inferior qualities of coal—even when containing as much as 20 p.ct. of ash—could be profitably utilized in this manner for boiler consumption. Coke breeze from gas-works and coke-ovens could also be put to profitable use in this way. It permitted of free circulation of air in the boiler furnaces, and formed no "clinkers" on the grate-bars. At Beckton and at the Liverpool Gas-Works could be seen plants producing ovoid briquettes, 1½ oz. each, from gas-coke breeze alone, agglomerated with pitch; while at the Wombwell Main Colliery was plant manufacturing similar briquettes from coke-oven breeze, "slimes" from the coal-washer, and 5 p.ct. of small coal, agglomerated with pitch.

Manchester District Institution of Gas Engineers.—There will be a quarterly meeting of the Institution at the Grand Hotel, Manchester, on Friday afternoon, the 25th inst. In addition to formal business, a discussion on "Coal Conservation in Relation to Gas Manufacture" will be opened by Mr. Tim Duxbury, of Oldham. Members who are experimenting with "steaming" in vertical, inclined, and horizontal retorts, and mixing blue water gas with coal gas, are invited to join in the discussion.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Thorough Re-Organization the Necessity.

Sir,—I must confess to having felt some regret on reading Mr. Carpenter's letter, because it seemed to advocate disruption at a time when closer union is desirable, and because also no one can have served a corporation, as I did for the best part of thirty years, without realizing how much there is in common between municipally-owned and company-owned gas undertakings. But in the region of finance their paths are clearly divergent; and it is probably in this direction, and in keeping an eye on those municipalities who are not the fortunate possessors of gas-works, and over the constant encroachments of road and railway authorities, that Mr. Carpenter's letter may be expected to bear fruit.

The question, however, as to what is to become of the Gas Companies' Protection Association is insignificant in comparison with the issue raised by the reconstruction proposals of the National Gas Council, which is no less than the recognition for all time of that body as the premier one to which is to be entrusted the fortunes of the gas industry—all other existing bodies being relegated to back seats, or, as in the case of the Society of British Gas Industries, given no seat at all. To me, at all events, this prospect is not an alluring one, and I earnestly hope that, before these proposals are adopted, every effort will be made to bring about a real union on the lines of the American Gas Association recently formed.

Chas. Hunt.

17, *Victoria Street, S.W., Oct.* 12, 1918.

"Treasures of Coal Tar"—A Warning.

Sir,—I regret that my bad writing has caused you to print my letter *re* "Treasures of Coal Tar" with the word "robbing" the trade, instead of "enabling" the trade, &c. The paragraph should read as below.

Hy E Jones.

13, *Queen Anne's Gate, Westminster, S.W.*1.
Oct. 9, 1918.

"Such combination and consolidation will be deferred, and perhaps defeated, if the various schemes be adopted for enabling the 'Trade' to get hold of our products, as formerly the Germans did by their secretly-worked purchases and exports."

Sir,—The letter from Mr. H. E. Jones in your last issue treats the question of the distillation of tar in an idealistic manner, and places the matter therefore out of practical range for a very long time, whereas there is pressing need for something to be done at once or in the immediate future.

Even were it possible to realize the combination Mr. Jones foreshadows, it would certainly be very uneconomical from the national point of view, at any time during the next decade at least, to establish new works, while plants remained in existence capable of distilling the whole of the tar produced, and while all available material and labour were required for carrying out work of vital importance.

So far as the industry is concerned, it would, in the meantime, be well safeguarded by the proposed scheme, which rests entirely on a profit-sharing principle, to which there are no limits; and it is difficult in these circumstances to see for the moment what advantage the industry would gain at the present time by becoming its own distiller.

H. C. Head.

Winchester, Oct. 11, 1918.

Results Compared with and without Steaming in Continuous Vertical Retorts.

Sir,—My letter in your issue of Sept. 17 was purely and properly concerned with the comparison of the effect of the different applications of the combustion chamber heats, and not a comparison of systems, as implied by Mr. West. Hence his communication does not assist the elucidation of the problem.

I would mention, *en passant*, that several engineers have directed my attention to the seeming paradox in Mr. West's reasoning, since he holds that "results without analysis" are without practical value, and then proceeds to show, by "results without analysis," the great practical values of something in which he is interested.

Returning to the subject under review. I consider the idea has been erroneously fostered, until there is danger of its becoming axiomatic, that 1400° C. applied to the bottom portion of vertical retorts is an element essential to the success of systematic steaming. I submit that the authenticated figures tabulated in my letter prove, by the immutable law of averages, that this particular application of combustion chamber temperatures (championed by Mr. West) is not a function of success. In other words, since 23,521 c.ft. of 460 B.Th.U. gas per ton of war-time coal is obtainable with approximately 1200° C. applied at the bottom of the retorts in the Dempster-Toogood system at Oldham, it necessarily follows that 1400° C. in this position is not a necessity. On the contrary, the *sine qua non* of good gas manufacture being to increase the yield of gas while keeping the inert contents as low as practicably possible, it is better, in my opinion, to apply lower temperatures at the bottom of the retort, and to reserve the very limited ignition or active combustion temperature for a higher and narrower region of the tapered retorts, where it can be more effective in searching the rising water gas and converting the stray CO_2—always remembering the limitations in the extent of this temperature available in any setting.

H. J. Toogood.

The Poplars, Elland, Oct. 10, 1918.

Stopes and Wheeler on the "Constitution of Coal."

Sir,—There is one statement in Mr. R. J. Sarjant's interesting critique of our "Monograph" to which we should like to reply.

We are arraigned for making "no reference whatever . . . to the pioneer work of one of our countrymen, Dr. J. A. Smythe." We are not guilty. Dr. Smythe's work with reagents is referred to on p. 37 of the "Monograph." His work with solvents, and with reagents also for that matter, was carried out with a brown lignite from Bruhl, near Cologne; and we specifically state that we do not deal with lignites. Such coals nearly always contain resins, often in large lumps. The extraction of such resins from brown lignite by means of solvents, when their separation by hand has so often been effected, did not seem to us worthy of special note, or calculated to advance our knowledge as to the survival of resins as normal constituents of bituminous coals, with which coals the "Monograph" was concerned.

We would point out also that the implication that we have not dealt with Messrs. Porter and Taylor's work and theory regarding the constitution of coal, must be due to an oversight on the reviewer's part, since we devote several paragraphs (pp. 8 and 12) to discuss them.

Marie C. Stopes.
R. V. Wheeler.

Eskmeals, Cumberland, Oct. 11, 1918.

Mr. Ed. C. de Segundo Replies to "Electricity Supply Memoranda" Criticisms.

Sir,—Owing to a series of fortuitous events, for which the recent railway strike was in a measure responsible, the corrected proof of my article did not reach the "Electrical Review" in time; and my article was printed as it stood in the rough draft. Moreover, by a printer's misconception, two tables with different column-headings were printed in one; and this alone cannot fail to have given rise to much confusion of thought, as the column-headings do not apply to the figures in the latter portion of the table. A letter to the Editor, in which I embodied the corrections made in the belated proof, was published in the succeeding issue, which, I can only assume, you have not seen. I have pleasure in enclosing herewith a typed transcript of the article as it should have appeared.

Will you permit me to offer a few comments upon your criticisms, or rather, to make my point of view more clear, because some of your objections are perfectly justified upon the facts as you knew them at the time?

First of all, let me say that in my analysis of Clause 7 of the Household Fuel and Lighting Order, I was concerned solely with an investigation into the question of the production of the householder's necessary heat and light with the minimum consumption of coal, irrespective of whether such coal were burnt in the householder's fireplaces, or supplied to the gas companies for distillation, or burnt under the boilers of the electric supply companies. I was not concerned with making out a case for gas, or electricity, or for anyone—except, perhaps, the Coal Controller, who has my deepest sympathy. No doubt the mutilated form in which my "Summarized Results" appeared in the "Electrical Review" is responsible for your conclusion that I "have been trying to show that, on the coal expenditure basis, the gas ration requires for its production about as much coal as the electricity ration;" and your strictures upon so manifest an absurdity are perfectly justified. But you will see from the correct version of my article that, while the gross initial demand on the Coal Controller is, on my assumptions, 1·60 tons of coal and 0·26 ton of coke for the gas ration, and 1·96 tons of coal for the electricity ration, the net draft on our coal resources looks very different when the "effective coal equivalent" of the coke produced in the distillation of the 1·60 tons of coal is taken into account. This difference is accentuated when the figures are reduced to the basis of a given quantity of "effective" heat produced. The respective quantities of coal then stand in the ratio of 1·17 in the case of gas to 3·75 in the case of electricity. You and I are thus practically at one, except upon the point of quantity of gas produced per ton of coal distilled. If this be taken as 12,500 c.ft., the ratio would be 0·93 to 3·75.

As regards the heat value of coke, I am aware that the calculated heat value (based upon the chemical analysis of coke) may work out to well over 13,000 therms per pound; but I think you will find that my allowance of 12,500 therms per pound of average coke obtainable to-day is a generous one. Mr. Arthur H. Barker (Lecturer in Heating and Ventilating Engineering at University College, London) tells me that recent determinations yield a calorific value of 11,000 therms per pound of good present-day coke, and that some samples which have passed through his hands have yielded much lower values on a calorimetric test.

I do not think I am far wrong in my views upon the waste of heat "in some types of gas-fire." I have had some practical experience in this direction. Nor do I think you should quarrel with my estimate of 55 p.ct. (not 90 p.ct.) loss in average gas-stoves used in average households by average householders. I am aware that, just before the war broke out, a new type of gas-stove was about to be introduced, which, it is claimed, has a very high heating efficiency, but that arrangements could not be completed in time for their manufacture on a sufficiently large scale. Of course, a gas radiator may have an "effective" heating efficiency of 100 p.ct. I have such a one in my house, and occasionally use it on very cold days for warming stairways and passages. But, obviously, it would not be suitable for use in a sitting-room; nor could such an appliance be considered representative of average gas heating in houses.

Now, there can be no question as to the fact that in certain types of hot-wire electric radiators, practically the whole of the heat-equivalent of the electrical energy dissipated appears as useful heat; and you can use such radiators in a closed room. Pray recollect that I distinctly stated in my article (Sept. 27) that I took as the basis for comparison the fuel consumption for warming our rooms—not for cooking. Please also bear in mind that, for the purposes of my analysis, I was necessarily bound to adopt average figures—not the best that could be achieved on each system. During the coming months we shall have

to deal with things as they are to-day—there is no time to alter them. I could not therefore base my analysis upon things as they should be, or might have been, had the coal stringency been foreseen in time.

I adopted the figure of 10,000 c.ft. of gas per ton of coal distilled as the average performance for large and small plants throughout the kingdom, on the authority of a gentleman who certainly ought to know what he is talking about. The adoption of your figure (12,500 c.ft. per ton of coal distilled) does not alter my conclusions, but only emphasizes them. This gentleman at first took the same view as you express in your question: "Why has Mr. de Segundo added to his 1½ tons of coal the "fuel" used in heating the retorts, seeing that the coke is part of the product of the same 1½ tons?" I pointed out to him that, so far as the Coal Controller is concerned, it was immaterial whether that particular quantity of coke was consumed in heating retorts, or burnt by the householder, or in the boilers of electric generating units. In either case it constituted a draft upon the fuel at the disposal of the Controller. My friend seized the point at once. Your conclusion that I had done this "simply to make the comparison with the average use of fuel in electricity stations look as bad as possible" was a trifle hasty, was it not?

I am not wholly ignorant of the value of the bye-products obtained in the distillation of coal; but, so far as my analysis is concerned, cost does not enter into the consideration. We are to-day faced with the urgent necessity of assisting the Coal Controller to make a certain (or rather uncertain) quantity of coal go as far as possible; and we have to adopt such measures for our heating and lighting during the next six or eight months as may be best calculated to reduce our draft upon his resources to a minimum. Personally, I have spent about £25 in altering my heating and cooking arrangements in order to save the Controller coal. This expenditure will be practically non-productive when we return to normal conditions. It may interest you to know that I have gas-stoves, gas-rings, a gas-griller, but no electric cooking apparatus. I have three small portable electric open hot-wire radiators for use when rooms are only to be occupied for short periods (compare the second table in my article as enclosed herewith).

Now, turning to the case for electricity. No one has found fault with me yet for adopting 5·5 lbs. of coal as the average consumption per unit sold, or for taking 1½d. as the price of electrical energy per unit for heating. I do not think the latter figure is seriously wrong for the average price throughout the kingdom; but I agree with you that, if it errs, it errs on the low side. The case, however, for continuous heating by electricity under conditions obtaining to-day is so hopeless, not only as regards cost to the householder, but also as regards demand on our coal supplies, that we can afford to be a little generous in order to disarm criticism from our electrical friends.

As regards the coal consumption per unit sold, the electrical man may legitimately urge that were he called upon to generate 25 p.ct. or 50 p.ct. more units, these additional units would not cost him anything like 5·5 lbs. of coal each, which is quite true. But, again, such additional quantity of units as might be demanded at such short notice, even if the Controller had advised the public to use electricity for heating, would not appreciably alter the average figure for coal consumption per unit sold throughout the kingdom.

Let me ask you this question: What would gas engineers do (and say) if they had to make gas out of the sort of stuff that passes for coal to-day, which electricity supply engineers have to negotiate somehow? If electricity works were supplied with coal of the quality used for the production of gas, the consumption per unit sold would sink to very much under my estimate of 5·5 lbs. As a matter of fact, both gas and electricity engineers are suffering seriously to-day from the large percentage of ash in their respective fuels.

The "co-efficient of causticity" in some of your remarks is pretty high; but your language is mild and soothing compared to what I said to myself when I saw my uncorrected draft, and in particular the mutilated table of results, in print. I hope I have not trespassed unduly upon your space.

Ed. C. de Segundo.

Dashwood House, New Broad Street, E.C.
Oct. 10, 1918.

MR. NICOL ON MR. DE SEGUNDO'S ARTICLE.

[Reprinted from the "Electrical Review."]

As a careful reader of the "Electrical Review," may I be permitted the following commentary on the above subject, as dealt with by Mr. Ed. C. de Segundo in your issues of Sept. 27 and Oct. 4?

Considered merely from the point of view of domestic heating, the figures, as presented by Mr. de Segundo, would appear to indicate that, on a cost and efficiency basis, the coal ration, as compared with the "equivalent" in gas, anthracite, coke, and electricity allowed under the Order, is the best and cheapest medium for heating. This, unfortunately, will be the conclusion arrived at by the majority of householders who have individually been given the opportunity to choose either the manufactured or raw material without, apparently, adequate guidance as to the bearing of their decision upon the question of national efficiency and economy.

The determination of the "equivalents," as allowed in Clause 7 of the Household Fuel and Lighting Order was, no doubt, arrived at in the light of a full knowledge of all the more salient factors—labour, transport, military, and political; but, in view of the relatively low gas and coke equivalents allowed, it is difficult to believe that the important bearing of this question upon the problems of adequate food production, the supply of fuel oils for the Navy, "raw" materials for explosives and industry, and the repair of our highways, received adequate consideration. Had due consideration been given to these factors, it is incomprehensible that gas and coke, except for the purpose of enforcing due economy, should have been rationed at all.

Allowing for a moderate coal consumption per unit delivered (5·5 lbs.), Mr. de Segundo shows that, in allowing 800 B.o.T.U. of electricity to count as one ton of fuel, the Controller of Coal Mines has to provide the electricity supply works with two tons of coal, which, in the process of conversion, is completely destroyed. Assuming a steam consumption of 33 lbs. per unit delivered—an unusually high figure—an average evaporation of only 6 lbs. of steam per pound of coal would, therefore, appear to be obtained from average quality coal used at electricity works.

Now, in addition to the gas recovered from one ton of coal delivered to a gas-works (about 12,000 c.ft.), there remain the following secondary products: 10 to 11 cwt. of coke, 2 cwt. of breeze, 12 gallons of coal tar, as well as 24 lbs. of sulphate of ammonia, of which 1,400,000 tons are required annually in order to ensure the adequacy of the world's harvests.

Considered as steam-raising fuel, the net evaporative value of the combustible secondary products compared with that of average quality coal slack is as follows:

	Net Evaporative Value per Lb.	Total Evaporation.
11 cwt. coke	9·8 lb.	11,093
2 cwt. breeze	6·0 lb.	1,344
12 gallons coal tar	14·0 lb.	1,558
		13,995
1 ton of coal slack	6·0 lb.	13,440

It will be seen, therefore, that the combustible secondary products of a ton of coal carbonized at a gas-works are approximately equivalent in net evaporative value to a ton of coal slack of average quality as consumed at electricity supply stations. In this connection, the announcement on p. 300 of the "Electrical Review," to the effect that arrangements have been made for the supply of 1000 tons of coke per week to an important London power station, is particularly interesting. Electricity generated from gas coke, or a blend of gas coke and coal slack of a kind useless for any other than fuel purposes, is a commodity quite different, from the standpoint of national advantage, to that generated by the complete destruction of coal capable of profitable treatment, as it largely is, either in coke-ovens or gas-retorts. The consumption of coal cannot at the present time be considered merely as a question of so many tons less or more, within limits, being consumed. The stern necessities of the present times demand that the greatest possible proportion of the coal used should be so consumed that its bye-products may be available as carbonaceous solid fuel and as the bases of high explosives, fuel oil, and of artificial manures. It is hardly needful to point out that these are only obtainable by the carbonization of coal, either in gas-works or coke-ovens.

E. W. L. Nicol,
Engineer and Fuel Expert, London Coke Committee.
Oct. 9, 1918.

Blue Water Gas and Calorific Power.

Mr. E. F. Keable, Engineer and Manager of the Gorleston and Southtown Gas Company, who read the paper on blue water gas practice, at the recent meeting of the Eastern Counties Gas Managers' Association, writes (in reply to criticisms as to the calorific power of his gas) that, since reading his paper, he has received a communication on the subject from an important gas company. Mr. Keable says the company in question have lately erected a ¾ million plant; and their chemist reports that the lowest value of gas produced is 315·4 B.Th.U. gross and the highest 321 B.Th.U. He adds: "You can, of course, easily imagine that their coke is stretched more than mine. Therefore the figure I gave is not so far out as most present thought. The plant in question, no doubt, produces methane; hence its value. I have never seen my test-flame on the plant any colour other than a bright yellow. I suppose my gas should be called 'yellow water gas' really, for it has never been blue."

Rotherham Corporation's Crude-Gas Powers.

The Rotherham Corporation, by one part of their new Act, have obtained power to purchase crude or coke-oven gas or waste heat from any company or person within the area comprising the urban districts of Swinton, Rawmarsh, and Greasborough, the rural district of Rotherham, except the parish of Brampton Bierlow, and parts of the rural district of Doncaster. The Corporation are authorized to lay mains for the purpose of bringing the gas into Rotherham. These powers, extended as they are to all classes of crude gas and waste heat, are, says the Town Clerk, entirely novel in character, and have not before been sanctioned by Parliament to any authority. In the past, limited powers have been granted enabling the purchase of coke-oven gas only. It is anticipated that these powers will result in the Corporation being able to obtain a supply of both high and low grade gas, of which the former can be used for the purposes of the gas undertaking, and the latter for generating steam for the electricity concern. These powers, if effectively carried out, should undoubtedly help to economize the consumption of coal. With regard to the waste heat, this can only be used for the purpose of driving electric plant on the site where the waste product is purchased; but to cover this the Corporation are authorized to put down electric generating plant at any point within their electricity area where they are able to purchase the commodity. Finally, with regard to this matter, the Corporation have now obtained general authority to purchase or sell gas in bulk to any adjoining local authority, company, or persons.

Scottish Increases in Gas Prices.—At Crieff the price of gas has been increased to 5s. per 1000 c.ft.—a rise of 5d. The rate at Falkirk has been put up 7d., bringing the price to 4s. 11d. per 1000 c.ft. There has been an advance at Sanquhar of 10d., making the rate 7s. 6d.

Maryborough (Queensland) Gas and Coke Company, Ltd.—The profit of the Company for the half year ended June 30, after making provision for the balance of duty on the issue of bonus shares, bad debts, repairs and renewals, depreciation, working expenses, and other charges (including the balance brought forward) amounts to £1286. Deducting the usual dividend at the rate of 6 p.ct. per annum, free of income-tax, the sum left to carry forward is £49.

REGISTER OF PATENTS.

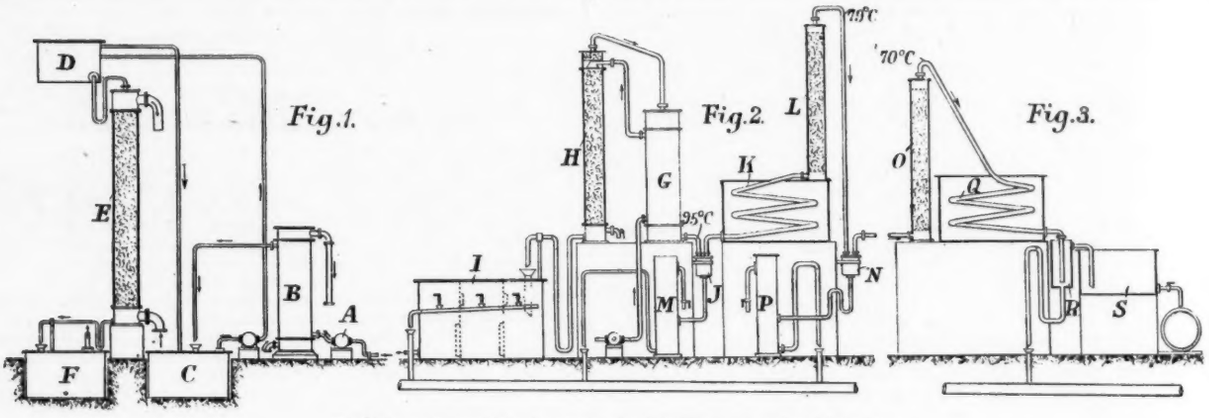
Extraction and Fractional Distillation of Oils from Coal Gas.—No. 118,730.

MARBAIS, D., of Charleroi, and DEGUIDE, C., of Ixelles, Belgium.
No. 15,923; Nov. 1, 1917.

This invention relates to a process for effecting during continuous working, and starting from coal gas, the extraction, the recovery, and the separation or fractional distillation of three spirits or oils, clearly classified, and capable of being immediately sold and utilized commercially. The first of these, composed of benzol or benzene, proceeds to distillation in the proportion of 90 p.ct. at 100° C. The second, termed "toluened spirit"—that is, a mixture of benzol, toluol, and xylol—proceeds to distillation in the proportion of 50 p.ct. at a temperature of 100° C. The third—termed "heavy spirit"—comprises a spirit or oil of the type of solvent naphtha and white naphthalene.

The arrangement adopted to bring about the fractioned and definite condensation of these last essences or oils, comprises an ascending coil K of a tube of small section, dipping into a vessel filled with cooling water, maintained at a constant temperature, and immediately followed by the tower L, which is of a section twenty-five to thirty times larger, and of a height equal at least to eight times its diameter, filled with a supply of material identical with that of the washer-towers E and distillation tower H. The steam, which acts as a vehicle for the oils which have not been condensed at about 95° C. and passing into the coil K, expands quickly in the tower L, is partially condensed therein, is broken up by its passage through the filling of the tower, and then, trickling out from top to bottom through the tower, rectifies the non-condensed vapours, which pass out through the top of the tower L at a temperature of about 79° C.

These products of condensation constitute essentially the oil or spirit previously termed "heavy oil." A complementary collector at the bottom of the coil K might be employed to collect them immediately and separately from the condensations which take place in the re-



Marbais and Deguide's Apparatus for Distilling Oils from Coal Gas.

material having large contact surface—for example, wood shavings, metal waste, shavings or turnings of iron, steel, or the like. The liquid is thus brought into intimate contact with the coal gas which enters into the washer-tower at the base, and passes out at the top deprived of its benzol. The liquid, broken-up or atomized by its passage through the dividing material in the tower, absorbs the benzol from the gas and escapes by a syphon tube into the reservoir F.

According to the importance of the volume of gas to be debenzolized, there will be one or more washer-towers arranged in series, the gas richest in benzol coming in contact with the liquid which is most charged with benzol; and, inversely, the gas which is poorest in benzol coming in contact with the fresh liquid not yet charged with benzol.

The relation between the diameter and the height of the interior dividing material in the washer-towers should, it is said, be 1:8 at least—that is to say, the height of the interior filling material should be equal to, or greater than, eight times its diameter.

SECOND PHASE.

The liquid charged with benzol is drawn off from the reservoir F and forced (fig. 2) into the tubular reheater G, in which it is heated by indirect contact with the steam and benzol vapours, through a sheaf of tubes, and whence it trickles out at the upper part of the distillation tower or column H. This column consists of a sheet-metal cylinder containing an interior filling which may be identical with that of the washer-towers E, and of which the effect is to break up or atomize the liquid charged with benzol. This filling must also be of a height equal to, or greater than, eight times its diameter. The column comprises, at its upper part and immediately above the entrance for the benzolated liquid to be distilled, a mattress or layer of dividing material similar to that of the filling itself within the column. The object of this is to prevent the carrying-over of particles or globules of the liquid to be distilled, and to cause a starting of the rectification of the mixture of steam and benzol.

The steam, delivered in a continuous jet at constant temperature and pressure at the base of the column, is brought into intimate contact with the liquid charged with benzol, which trickles out (broken-up or atomized) through the filling material in the column. The steam, charged with benzol vapours, passes out from the distillation tower and through the mattress, traverses from top to bottom the sheaf of tubes of the reheater G, and makes its exit at a temperature of about 95° C.

The liquid, deprived of all trace of benzol, escapes from the column H through a syphon tube into a decanter-reservoir of water I, having several partitions. It there separates itself from the water coming from partial condensation of the steam in the column H, by progressive decantation based on the differences in density, and is drawn by the pump A and forced into the temperature-exchanger B (fig. 1) and serves afresh (as explained in the first phase of the process) while the water is carried off by the pipe shown.

THIRD PHASE.

The steam, charged with benzol vapours, passes out from the reheater G at a temperature of about 95° C., into a draining device or collector J (fig. 2). In this device are collected the steam in excess, the major part of the carrier-steam, the globules of oil accidentally carried over, the spirits or oils which condense in a steam medium at about 95° C., as well as the spirits or oils which are condensed in a refrigerating coil K, and in an expansion and rectifying tower L immediately above the coil K.

These products of condensation escape from the collector J for water separation, which eliminates the water by continuous decantation, and allows the heavy oil to flow out in a continuous discharge into a receiver. By progressive decantation and cooling of this oil or spirit the solvent naphtha is eliminated and collected—the naphthalene being deposited at the bottom of the decanting receivers.

The non-condensed vapours, passing out at a temperature of about 79° C. at the upper part of the expansion and rectifying tower L, progress into a collector N, and through a jointed pipe-connection from the latter into a rectification tower O (fig. 3), identical, as regards dimensions and interior filling material, with the tower L. The temperature of the vapours at their exit from this last tower being about 70° C., there is produced in the mass of the filling in the tower a condensation of spirits or oils which trickle down and rectify the non-condensed vapours which traverse the mass from bottom to top. These condensates are collected in N (fig. 2) at the base of the tower O, and are sent into a tower P for separating-out water, identical with the separating tower M. The toluened oil or spirit is thus collected, consisting of a mixture of benzol, toluol, and xylol.

Finally, the non-condensed vapours, rectified in the towers L and O, are completely condensed in a descending coil refrigerator Q (fig. 3), separate in an automatic decantation chamber R from their carrier-water, and are ultimately collected in a reservoir. These oils constitute the benzol or benzene properly so called.

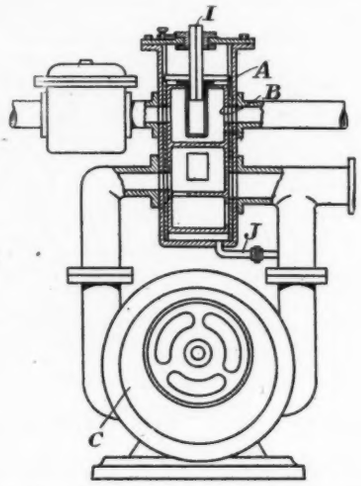
Gas and Air Regulators.—No. 118,870.

SELAS-TURNER COMPANY, LTD., of Coventry, and TURNER, E., of Urmston, near Manchester.
No. 11,425; Aug. 9, 1917.

This invention consists in controlling the flow of two or more gases or vapours which arrive in separate streams at any desired constant

pressure relative to each other, by the variation in the outlet pressure of one of the streams so that a proportional volume or flow of the separate streams, and the pressure of the controlling stream, can be maintained constant—independent of the rate of flow.

The invention is primarily directed to controlling the proportionate flow of air and gas (under pressure) in separate streams to a point where they may be preheated to a high temperature before commingling at the point of combustion. This is effected by passing the streams of gases or vapours through a regulator having a valve or interconnected valves provided with separate inlet and outlet passages or ports for the separate streams, so constructed or organized that the volume of the fluids flowing through it is controlled by an axial movement and their relative proportions by an angular movement, or *vice versâ*.



Turner's (Selas-Turner Company) Gas and Air Regulator.

The illustration shows a sectional elevation of one form of the apparatus.

Here a regulator casing A is provided with a hollow piston valve B divided into as many compartments as there are separate fluids—two compartments being shown. Each is provided with a separate inlet and outlet opening adapted to register with a separate inlet and outlet port in the regulator casing so as to provide a separate passage for each of the fluids. These ports are so shaped and proportioned that angular rotation of the piston relative to the casing causes the proportional flow of the fluids to be varied, while axial movement of the piston relative to the casing causes a proportionate variation in the flow of all the streams, somewhat after the manner of regulating the incoming gases in the regulator described in patent No. 106,296, except that in the present invention there is no commingling of the gases within the regulator.

An air compressor C is provided with a regulator casing formed in two parts, one having inlet and outlet ports for the gas and the other having inlet and outlet ports for the air, together with a bye-pass port leading from the delivery side of the compressor to the suction side. Slidably mounted within the casings are two hollow piston valves, in each of which are formed ports corresponding to the ports in the respective casings. The valves are secured to a square spindle I slidably mounted in the fitting by means of which the spindle, together with the valves, can be rotated.

Provision is made to impart rotary movement to the valve as described in the earlier patent; and an air-passage J is provided leading from the delivery side of the compressor to the under side of the valve, so that the compressed air tends to raise the valves, when a predetermined pressure is exceeded, in order to bring the bye-pass opening in the valve into register with the outlet port in the casing.

Burners for Pitch.—No. 118,890.

SOUTH METROPOLITAN GAS COMPANY and KIRBY, A., of East Greenwich, S.E.

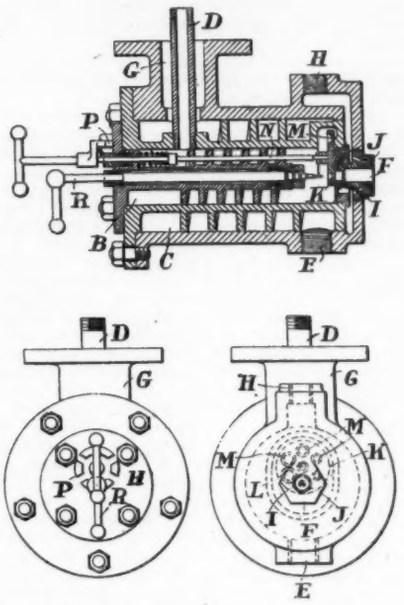
No. 13,205; Sept. 14, 1917.

The object of this invention is to provide a pitch burner which, besides maintaining the fluidity of the pitch and securing its injection into the furnace, secures its efficient atomization and avoids any clogging in the nozzle.

The invention consists in combining with the steam jacketing and steam injection appliances, means which will permit of regulating the sectional area of the nozzle orifice without the introduction of an obstruction into the latter. Further, the atomization is assured by the employment of a steam-jet in close proximity to the injector jet. The melted pitch travelling through the jacketed chamber is preferably caused to take a zig-zag course by inserting a worm inside the chamber; while a similar worm inside the jacket imparts a serpentine course to the steam. The adjustment of the size of the orifice through which the pitch issues is secured by a disc having several apertures of different dimensions arranged in a circle, so that by rotating the disc any desired size of aperture may be brought into alignment with the orifice.

The illustration shows the pitch burner in longitudinal section; also face views of the front plate and of the plate at the opposite end.

The burner comprises a pitch chamber B, and a steam jacket C surrounding it. Both chamber and jacket contain worm channels for giving the fluid pitch and steam respectively a serpentine course.



Kirby's (South Metropolitan Gas Company) Pitch Burner.

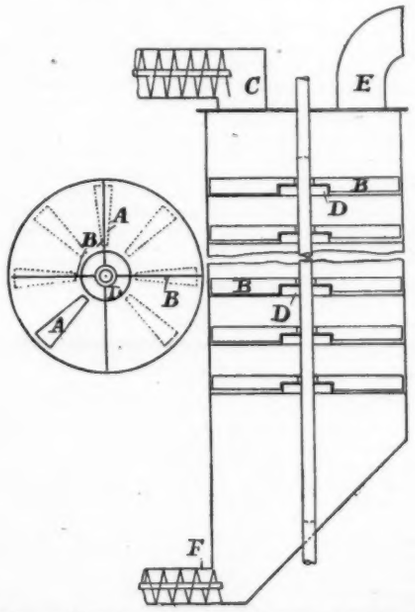
Fluid pitch is led by the pipe D and steam to the jacket by the inlet E. The pitch passes in the chamber B until it reaches the outlet F, which is fitted with a regulating plate and an injector and atomizer. The steam, on reaching the region of the pitch inlet, and heating it, leaves by the outlet G, and is taken (by passages not shown) back to the burner, the casing of which it enters at H. The steam then divides to form an injector for the pitch at I and an atomizer at J, both in the form of annular channels at the outlet F, which is furnished with a disc K for regulating the outflow. This disc is provided with a series of holes M of different sizes, either of which can be brought opposite the outlet, so as to regulate the discharge. N is a spindle which keeps the plate K seated under the pressure of a spring and also serves to rotate it by means of its square end to bring the selected hole opposite the outlet. P are slots in the casing cover to engage the extension on the spindle and to fix its position when the plate K is adjusted. R is a cleaner rod capable of an endway thrust into the hole which happens to be in alignment; the end of the rod having several diameters to fit the various-sized holes in the plate.

Mechanical Retorts for the Destructive Distillation of Carbonaceous Substances.—No. 118,960.

BLAIR, CAMPBELL, AND M'LEAN, LTD., ROSS, J. K., and CORNER, E. P., of Glasgow.

No. 18,478; Dec. 13, 1917.

This invention has reference to mechanical retorts of the class wherein a rotating vertical shaft carrying horizontal arms causes the latter to revolve over a series of trays or plates superimposed over each



Ross and Corner's (Blair, Campbell, and M'Lean) Mechanical Retort.

other at spaced distances apart within a vertical vessel, and wherein the material to be treated is fed in at the top and is carried round over each tray and automatically falls in sequence at regular times

through slots to the trays below—means being provided for the passage of an upward current of gaseous fluid to act on the material in its passage downwards.

An internal elevation of the proposed retort and a horizontal transverse section taken over one of the superimposed trays, and showing the rotating arms and driving shaft, are given.

The essential features of the invention consists of a vertical, preferably cylindrical, cast-iron shell in which are a series of trays. Openings A are made in each tray through which the material being treated can drop from tray to tray—the openings being arranged in such a way that the material requires to travel as far as practicable round each tray before reaching the openings giving access to the next tray. A shaft works through the centre of the vessel; and to it are attached arms B fitted with blades, brushes, chains, rakes, or any other mechanical device suitable for gathering together or carrying round the substance being treated; the efficient spreading or distributing being obtained by arranging each blade in a set at a different height above the trays. Thus when the material has been fed by screw gear through the inlet pipe C and has dropped through an opening A from the tray above, the first blade (which is set highest from the tray) takes a top layer off the heap of material, while each successive blade will take another layer off, until the last or lowest one. To enable the vapours being distilled to have free passage to the outlet, an annular space D is left at each tray round the shaft. This ensures that, apart from the spreading or mixing effect of the blades, all the material will have a long enough travel to effect thorough carbonization, and also that the vapours will pass through the coldest part of the apparatus.

Covers are provided for the top and bottom respectively. The top one has openings for the vapour, and is arranged to connect-up the vapour pipe E from the retort to the condenser. The bottom cover is provided with an opening F for the discharge of the residue in such a manner that any mechanical withdrawing apparatus (such as described for the inlet) may be attached.

LEGAL INTELLIGENCE.

BRITISH COKE-OVENS, LTD.

Liquidator Appointed.

At the offices of the Board of Trade, Carey Street, W.C., on Tuesday last, the first meeting of creditors and contributories interested under the liquidation of the British Coke-Ovens, Ltd., of 7, Princes Street, Westminster, S.W., was held before Mr. H. E. Burgess, the Official Receiver.

The Winding-up Order was made on the petition of the Lewis Merthyr Consolidated Collieries, Ltd., of Cardiff, who were creditors for £5366. A statement of affairs has been filed showing liabilities amounting to £6647 and assets valued at £351.

With regard to contributories, the total deficiency amounted to £16,986. The Company was incorporated on Dec. 29, 1913, as a private company. The nominal capital was £21,000, of which £10,687 was returned as having been paid up or credited as being paid up. In January, 1914, the Company acquired from F. M. N. Schuster (now interned) certain patents and inventions relating to the construction of coke-ovens and bye-products plant, together with the benefit of future improvements, and all British and foreign patents in respect thereof—the consideration being £825 in cash and shares. Subsequently, the Company acquired other patents. In March, 1915, the Company entered into a contract with the proprietors of a large company in South Wales for the erection of a battery of 41 waste-heat coke-ovens for £6050. When the ovens were completed, it was then found that they failed to work properly, eventually breaking down entirely. In July, 1916, the Company entered into a contract with another colliery for the erection of a battery of 25 regenerative coke-ovens for £9000. In this case the ovens worked satisfactorily. Owing, however, to the fusion of the fire-brick lining, a claim for £1000 damages was made against the Company. Arising out of the failure of the first battery of coke-ovens, the colliery claimed damages amounting to £44,597. The matter was referred to arbitration; and the arbitrator awarded the colliery £5366. Owing to this litigation, the Company, in June last, passed a resolution for voluntary winding up. On the petition of the Colliery Company, however, a compulsory winding-up order was made on Aug. 14 last. The failure of the Company was attributed to the adverse award in the arbitration.

Eventually it was decided to appoint the Official Receiver as Liquidator of the Company; and at the meeting of shareholders a similar resolution was passed.

Accrington Service Layer's Appeal.—Singular circumstances were associated with the appeal, before the Accrington Local Tribunal, a fortnight ago, of a widower (41, Grade 1, with two children). Appellant was formerly in a certified occupation as a pipe-fitter, employed by the Accrington District Gas and Water Board; and for the convenience of the Board he accepted a position with them as temporary caretaker. He was given a Munition Area Recruiting (M.A.R.O.) card; but this had been withdrawn, and the Recruiting Officer returned him as a temporary caretaker only. The consequence was that the man could only appeal to the tribunal on domestic grounds, though in addition to his work of looking after the offices he was also engaged connecting-up cookers and fires and doing service-laying. He would have been in a certified occupation, if he had not accepted the M.A.R.O. card. The authorities would not now recognize an appeal on occupational grounds, though, as a matter of fact, the work the man was now doing was of a certified character. In the result, the man was ordered to report on Nov. 30; but more than one member of the Tribunal thought something more should be done for him in the exceptional circumstances.

MISCELLANEOUS NEWS.

AUSTRALIAN GASLIGHT COMPANY.

Altered Constitution.

In accordance with a notice signed by the Secretary (Mr. R. J. Lukey) a special general meeting of the proprietors of this Company was held on July 19 for the purpose of considering, and if thought fit passing, a series of resolutions dealing with the administration of affairs. The changes involved were slight, but were rendered necessary by the provisions of the recently-passed Gas Act.

The resolutions adopted provide briefly for the following: The number of Directors to be seven, of whom four (not three as was first proposed) shall form a quorum; no person to be eligible as a Director unless he be the holder of at least 150 shares; the allowance for Directors to be £2000 yearly, to be divided among them. The office of Director is to be vacated: (1) If he ceases to hold 150 shares, at least, in the capital of the Company in his own right; (2) if his estate be sequestrated for the benefit of his creditors, or he makes an assignment for the benefit of his creditors or takes any proceedings for liquidation by arrangement or composition; (3) if he be declared a lunatic or confined in an asylum or gaol as a lunatic; (4) if he resigns his office or refuses to act; (5) if he resides out of the Commonwealth of Australia for the space of three calendar months continuously without the permission of the Directors, or without such permission absents himself from the meetings of the Directors for a like period; (6) if he be convicted of felony or any misdemeanour punishable by law. It is provided that the Directors may remunerate in such way as they shall think fit any Director or Directors performing any extra services, or incurring any liability or expense on account of the Company.

NEW BRITISH AND "KEY" INDUSTRIES EXHIBITION.

Men associated with industries having a technical basis will find interest and pride stirred by a visit to the Central Hall, Westminster, where the Tariff Reform League have made themselves responsible for organizing an exhibition displaying some of the work that has been done in this country during the war in the founding of new British industries and in promoting "key" industries. The exhibition discloses the fact that among the industries of this country there was a large amount of latent power which only required some stimulus to bring it into activity and productivity. The war has given this stimulus. German industry will find that war has other than direct effects; and these other effects will prove permanently damaging to a country the responsible men of which have been conducting the war with all the horror and infamy that their inhumanity can conceive. The illustrative exhibition of what has been done by our home industries is free to the public, and will remain open until Oct. 22, after which, we understand, it will be removed to Manchester and subsequently to other centres.

What is a "Key" Industry?

The official answer to this question is that "for practical purposes, the term is applied and should be confined, to those industries which are in themselves comparatively small, but are nevertheless of vital importance, since upon their existence that of other and greater industries depend." We are not altogether in sympathy with the definition. It would hardly apply to the gas industry, and yet the gas industry, through its work, is of fundamental importance to many industries that are not its superior in magnitude. The dye industry is cited as a "key" one. The annual value of the dyes, mainly imported from Germany, which were used in the textile and paper industries of this country before the war, was about two millions sterling, and the annual output of these industries was valued at about two hundred millions, giving employment to about a million and a half of people. So that in this case the "key" industry was about 1 p.ct. of the main industry. There is, however, another sense in which we may refer to industries as being "key" industries. Speaking in the House of Commons on Feb. 23, 1917, Mr. Lloyd George said that: "The war at any rate has taught us one lesson, that the preservation of our essential industries is as important a part of the national defence as the maintenance of our Army or Navy." In reply to a deputation of manufacturers, who waited on him on July 31 this year, he said: "During the war we have undoubtedly discovered that there are industries in this country that are essential, not merely from the commercial point of view, but from that of national defence and security. Under no conditions, and whatever it cost, should we let these industries down in the future." The gas industry would come into this category as a "key" industry. Tungsten, nickel, monazite sands, coal-tar derivatives, optical glass, and magnetos are quoted as "keys." Regarding tar, the information is given that, up to the last few years, this country was by far the largest producer of coal tar in the world; and we are still, or were at the outbreak of war, second only to Germany in this respect. Similarly the raw materials of almost all the other "key" industries are to be found in abundance, and in some cases exclusively, within our own Empire. Yet we allowed these priceless Imperial resources to be controlled, and in some cases practically monopolized, by our deadliest enemies. As to monazite sands before the war, Germany had secured the control of practically all known thorium deposits in the world. Hence her control of the world's production of incandescent gas mantles.

Coal Tar Dyes.

The catalogue of the exhibition is prefaced by a number of articles by various authorities. There is one by Dr. E. F. Ehrhardt and

Mr. Alfred Edge on the above subject. The contents of the article tell the well-known tale of the loss to this country of the dye industry, and how Germany profited by our neglect. "The ease with which the large dye factories could undertake the manufacture of explosives and other munitions showed what a potent asset they were to a country at war, and how seriously our past neglect of the aniline colour industry handicapped us in the world conflict in which Great Britain was unexpectedly called to play an important part." What is being done in the way of reconstructing and permanently establishing the dye industry in this country is also sketched. Incidentally, it is remarked that there is no such thing as finality in this highly scientific industry; and there is the warning that we shall not establish the industry on a foundation firm enough to stand the test of peace-time conditions by merely manufacturing well-known colours on the lines of German patents. The new British dye industry must have individuality if it is to live; and the life-blood of the industry is research.

Electric Carbon Manufacture.

Other articles follow on tungsten, spelter, nickel, manganese, lead, antimony, graphite, monazite sand, the magneto industry, glass, rubber, and other things, including electric light carbons. Regarding these, the General Electric Company in 1902 laid down carbon works at Witton. A large number of very difficult problems had to be solved before a satisfactory article could be produced. Knowledge and experience in carbon-making were locked up in a few minds not resident in this country, the problem of educating the workpeople employed was a very serious one, and the supply of raw materials had to be organized. A suitable carbon as a substitute for retort carbon was found in this country; and English tar refiners were taught to make the necessary quality of tar. But as far as one of the most important ingredients of carbon-making is concerned—viz., lamp-black or soot—the carbon works were for a long time dependent for their supplies on Germany. In these circumstances, the Company, realizing the necessity for making this industry altogether independent of foreign supplies, determined to put down a soot factory, which has now been running for about six years with excellent results.

Monazite Sand.

The article on this subject points out that at the outbreak of war the incandescent mantle manufacturers in this country were entirely dependent upon Germany for their supplies of the nitrates of thorium and cerium. This was partly due to the fact that the German thorium manufacturers had secured a monopoly upon the principal deposits of monazite sand. The process of manufacture was also one of the most jealously guarded of all the German secret processes. The principal deposits of monazite sand are found in Brazil and at Travancore, one of the Southern States of India. The Travancore deposit is nearly 50 p.ct. richer in thorium; and therefore the sand found there is more economical and remunerative to work. A concession over this deposit was originally granted to an English company; but their rights were subsequently acquired by another company registered in England—the Travancore Minerals Company—in which, however, the majority of the shares and the controlling interest were held on behalf of the German industries. The whole of the output of sand was taken by the German thorium manufacturers; and notwithstanding a clause in the original concession purporting to safeguard British industries, it was impossible for an English firm to obtain any Travancore sand either for experimental or manufacturing purposes. Then in 1914, Mr. Harrop, one of the partners, and chief chemist, of the London Thorium Company, took the matter up with the India Office with the view of breaking-down this monopoly. The war eventually brought matters to a crisis; and as a result the German interests in the Travancore Minerals Company have been expropriated. It is now British controlled, with a nominee of the India Office as Chairman; and the sand can be obtained by any British manufacturer who requires it. The smashing of the German monopoly proved to be only a small difficulty in comparison with the manufacture of the thorium and cerium salts. All the information in the chemical text books, which were principally based upon German publications, was found to be either inaccurate or misleading. At the best, the processes described were laboratory processes, and incomplete at that. After two years of patient and exhaustive experimental work on the part of Mr. Harrop, his firm have now a plant and process at work producing nitrate of thorium and other chemicals upon a commercial scale. Whether their process is the same as that used by the German manufacturers cannot be said; but there is reason to believe that their cost of production is no higher than that of Germany would be under equal conditions, and that they should be able to meet them in competition if occasion should arise.

A large diagram exhibited in the exhibition shows that in 1913 50 p.ct. of monazite sand was found on British land; the remainder in other countries. Mark this! against Germany is *Nil*. But when we come to where the rare earths are extracted, we have Germany accounting for 60 p.ct.; all other countries combined, for only 40 p.ct. Finally, it is shown that in 1913, the consumption of gas mantles in the United Kingdom was 100 millions. Of these only 20 p.ct. were made by British firms in the United Kingdom; 30 p.ct. by German firms in the United Kingdom; while 50 p.ct. were imported into the United Kingdom from Germany. We are asked to note that four out of every five mantles used were of German origin.

THE EXHIBITS.

Chemicals.

Stands of various descriptions and glass cases give accommodation to the exhibits.

Among the exhibitors of chemicals, we notice the British Cyanides Company, Ltd., and the British Potash Company, Ltd. The Thermal Syndicate, Ltd., are showing silica ware for chemical works, and "Vitreosil" laboratory ware.

Coal Tar Industry.

This section is divided into: (1) Distillation of Coal and Tar; (2) Dyes; (3) Other Coal Tar Products; (4) Application of Dyes.

In the first grouping Simon-Carves, Ltd., are showing a model of regenerative coke-ovens, and a number of interesting photographs.

The Coppée Company are also exhibiting samples of coal, coke, and bye-products, with models of coke-oven and bye-product plant.

The Lennox Foundry Company, Ltd., are illustrating their tar distillation plants, with the object of showing the manufacture of plant for the production of many chemical bodies hitherto not made in this country.

The Leeds Fire Clay Company have on view specimens of fire-clay retorts, firebricks, coke-oven blocks, firebrick blocks, &c.; and Messrs. Mobberley and Perry, Ltd., are showing samples of their fire-clay materials, including a model gas-retort.

The Gas Light and Coke Company have a very attractive stand; and it is a complete demonstration of the importance of the gas industry to chemical production, as well as of the marvellous storehouse that tar is. We have here shown the direct products of tar distillation—viz., coal tar, dehydrated tar, pitch, anthracene, creosote, light oil, crude carbolic acid. Pure products: Benzol, toluol, solvent naphtha, pyridine, carbolic acid, cresylic acid, naphthalene. Fuel specialities: Fuel oil, fuel Diesel oil, "Navy" oil. Coal-tar derivatives: "Beta" naphthol, salicylic acid, acetyl salicylic acid, phenacetin. Ammonia and sulphur products: Gas liquor, concentrated ammonia liquor, liquid ammonia, anhydrous ammonia, nitric acid, sulphuric acid, sulphate of ammonia, nitrate of ammonia. Cyanogen products: Sodium ferrocyanide, sodium cyanide, blues for dyeing, paper staining, pigments, printing inks and laundry purposes, ordinary lump blue, special bronze blue lump (1918); special bronze blue in paste and powder forms, soluble special bronze blue.

In the second division, naturally British Dyes, Ltd., take a prominent place. There are samples of the fundamental intermediate products obtained from coal tar, together with substance samples and dyed patterns of the dyestuffs manufactured therefrom. The large number of products included in the exhibit which were not made in Great Britain prior to the war illustrates the great progress made under the difficult conditions prevailing. The exhibit of British Dyes, Ltd., is designed to illustrate three points: (1) The various stages through which the distillates of coal tar pass to be converted into dye-stuffs. (2) The progress made towards the ultimate object of rendering Great Britain and the Colonies independent of outside sources of supply. (3) The wide range of Government equipments for which British Dyes, Ltd., have supplied the dye-stuffs.

Messrs. Levinstein, Ltd., and the London Dye Manufacturing Company, Ltd., are similarly exhibiting. Messrs. Brotherton & Co., Ltd., are making an excellent display of ammonia and tar products of large variety, including benzol, naphthalene, toluol, carbolic crystals, pyridine, xylol, cresylic acid, anthracene, solvent naphtha, &c.

Besides experts, the lady visitors are vastly interested in the materials which show the application of British-produced dyes. There are a large number of exhibitors in this division.

Glass.

Messrs. Chance Bros. are among the exhibitors in the glass section. They have a large assortment of optical glass; and they also show heat-resisting globes and cylinders, including those for high and low pressure incandescent gas lighting.

The Silica Syndicate, Ltd., are exhibiting quartz glass, which, we are informed, does not crack when subjected to the most violent and sudden changes of temperature. It is, for instance, stated that it is possible to take a vessel of this material and plunge it into cold water, having previously brought it to a red heat in a gas-flame, without the quartz cracking or being damaged in any way. Similarly the vessel may without injury be exposed to a naked flame without having been previously warmed up. The New English Glass Manufacturers, Ltd., are exhibiting heat-resisting glass globes.

From Monazite to Mantles.

The Travancore Minerals Company, Ltd., are showing monazite sands, and specimens of the rare earths. They have also on view some interesting photographs of the operations of gathering, drying, and shipping monazite sand. The London Thorium Company are exhibiting thorium nitrate, cerium nitrate, and didymium salts for incandescent mantle manufacture, cerium oxide, cerium oxalate, cerium chloride, and cerium fluoride. Messrs. Curtis's and Harvey, Ltd., have an exhibit incorporating the raw materials used in mantle manufacture, as well as the completed mantles. The Plaissetty Company are making a similar display; while Messrs. Howlett & Co. are showing samples of magnesia clay, nozzles, mantle rings, and rods.

Of course, the scope of the exhibition is not by any means indicated by these notes, which only refer to exhibits which are of immediate concern to the gas industry.

GAS-WORKERS' WAGES AGREEMENT.

From Colonel Will Thorne, M.P., it is learned that a settlement has been reached in the demand of the gas workers for an increase of wages of 10s. a week for men and women over eighteen years of age, and of 5s. for employees under that age. The settlement provides for an advance of 3s. 6d. per week or 7d. per day or shift for men and women, and half these amounts for the younger employees, with similar advances to piece workers.

An important clause in the agreement provides that the parties concerned may again request consideration of the wages question at the end of a four months' period, commencing from last Friday week.

The agreement, which affects over 100,000 persons throughout the country, only embraces the employees of private gas companies; but negotiations are in progress between the several unions concerned and the municipal gas undertakings, and it is expected that a similar arrangement will be come to in respect of their employees.

COMMITTEE ON PRODUCTION AWARDS.

Further awards in connection with gas-workers' wages which have been referred to them have been issued by the Committee on Production.

Ascot District Gas and Electricity Company.

The parties to the reference were the Company and the National Union of General Workers. The claims submitted were: Gas-Works.—(1) That 8-hour shifts be instituted in place of 12 hours now worked. (2) Yardmen to receive time-and-a-half for overtime and double time for Sunday work. (3) Soldier reservists now receiving 7¾d. per hour to be paid 9¼d. per hour. (4) Boys to receive 1d. per hour advance. (5) The system of short time in winter to be abolished. (6) Fitters to receive time-and-a-quarter for overtime up to 7 p.m., time-and-a-half after, and double time for Sunday work. (7) That the full terms of Gas Workers Award (No. 1068) be put into operation, and be dated back to March 21, 1918. Electricity Department.—(8) That the full terms of the award, to date back to October, 1917, be given to all men in this department. (9) That weekly servants not receiving overtime pay be allowed a generous scale of payment when sick. Representatives of the parties were heard on Sept. 23. Prior to June, 1918, the majority of the men concerned received a war bonus of 7s. 6d. per week. In June last, in response to an application from the men to participate in the award to gas-workers (March 27, 1918), the Company granted a further advance of 4s. per week, *plus* the 12½ p.ct. bonus on earnings. At the hearing it was stated that an alteration in shifts was impracticable for small gas undertakings owing to war-time conditions. The award of the Committee is in the following terms: Items Nos. 1, 3, 4, 5, and 7 of the claim have not been established. With regard to items Nos. 2 and 6, overtime shall be paid for at the rate of time-and-a-quarter for the first two hours and time-and-a-half thereafter, and at the rate of double time for Sundays. The Committee recommend that the parties concerned meet to discuss item No. 9 of the claim, also whether, in view of the advances granted to the men up to June, 1916, 4s. per week was an adequate advance thereafter. The award shall take effect as from the beginning of the first full pay following Sept. 30.

Redditch Urban District Council (Surveyor's Department).

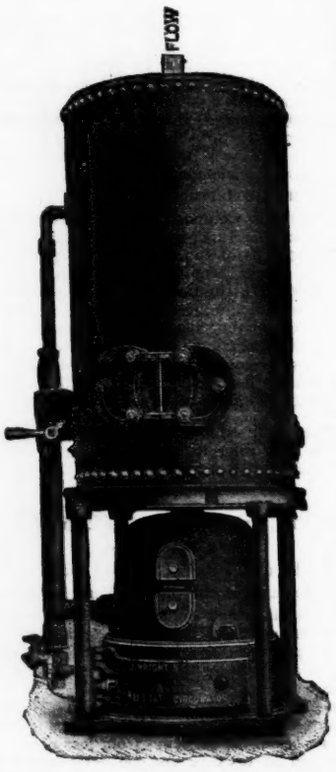
The parties to the reference were the Urban District Council and the Amalgamated Society of Gas, Municipal, and General Workers. The claim submitted was that the Committee on Production award, dated July 2, 1918 (No. 1747), Semi-skilled and Unskilled Employees—Birmingham Corporation, and award dated July 24, 1918 (No. 1920), Engineering and Foundry Trades, should be made applicable to the employees of the Urban District Council (Surveyor's Department). Representatives of the parties were heard on Sept. 20. The award of the Committee in full settlement of the claim submitted is as follows: As from the beginning of the first full pay following Sept. 20, the able-bodied men concerned, aged 18 years and over, shall receive an advance of 4s. per full ordinary week. The amount awarded is to be taken into account in the calculation of payment for overtime or night duty or for work on Sundays or holidays (where extra payments are made for such work), and is to be regarded as a war advance and recognized as due to, and dependent on, the existence of the abnormal conditions now prevailing in consequence of the war.

Hornsey Gas Company.

The parties to the reference were the Company and the National Union of General Workers. The claim submitted was for the payment of the bonus of 12½ p.ct. to adult workers as from March 21, 1918, in accordance with award No. 1068, up till the date on which the Company commenced to pay such bonus, and the payment of award No. 1068 to boys and youths as from March 21, 1918. Representatives of the parties were heard on Sept. 28. The Company have paid the bonus of 12½ p.ct. to the men concerned as from May 25, 1918. The Company were not parties to the general gas-workers' award (No. 1068). In their award, the Committee held that the claim for retrospective payment of the bonus as from March 21 had not been established. As from the beginning of the first full pay following Oct. 3 the boys and youths concerned shall receive an advance of 2s. per week, payable at the rate of 4d. per day or per shift for each day or shift worked. This amount is to be regarded as a war advance and recognized as due to, and dependent on, the existence of the abnormal conditions now prevailing in consequence of the war.

Boston Gas Light and Coke Company.

The parties to the reference were the Company and the Dock, Wharf, Riverside, and General Workers' Union. The claim submitted on behalf of members of the Union was for the observance of the award of the Committee on Production in respect of gas undertakings. Representatives of the parties were heard of Sept. 24. The men concerned have received an advance of 4s. per week in accordance with the award in question (No. 1068), but have not received the bonus of 12½ p.ct. on earnings. The bonus of 4s. was paid voluntarily by the Company (who are not certified) on April 6. The men's claim in respect of the 4s. advance is for one week's back payment. They also claim the bonus of 12½ p.ct. The men concerned have received the following war advances weekly: Stokers, 18s. 9d., labourers (yardmen) 18s., and fitters 15s. Their weekly earnings were: Stokers 53s. 9d., labourers 39s., fitters 44s. The award of the Committee is as follows: (6) The claim of the men concerned to one week's retrospective payment of the 4s. advance given on April 6 has not been established. (7) The men concerned, aged 21 years and over, who are paid as plain timeworkers, shall receive a bonus of 12½ p.ct. on their



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earnings, which shall not alter, or become part of, their time rates. (8) Clause 7 of this award shall not apply to any workmen in receipt of any allowance or bonus other than: (*a*) An allowance or a bonus wholly dependent on time-keeping; (*b*) an allowance or a bonus (not being a bonus on output) less favourable to the men than the advance of 12½ p.ct. hereby awarded, in which case the existing allowance or bonus shall merge in the 12½ p.ct.; (*c*) war advances given to assist in meeting the increased cost of living since the outbreak of the present war. (9) The men concerned, aged 21 years and over, who are pieceworkers, or are paid on a premium bonus system, or any mixed system of time and piece, or any system of payment by results, including men working at augmented time rates fixed in lieu of piece rates or by reference to results or to output of work, shall receive a bonus of 7½ p.ct. on their earnings. (10) Any bonuses or war advances which, in the case of time-workers, have merged in the bonus of 12½ p.ct. shall, in the case of pieceworkers, merge in the 7½ p.ct. bonus awarded under Clause 9 of this award. (11) If any payment has been made to the workmen concerned pending the general consideration of their position in relation to the bonus of 12½ p.ct. or 7½ p.ct., whether by agreement or as a result of arbitration, the amount of such payment shall merge in the bonus awarded under Clauses 7 and 9 of this award, and such bonus shall be in lieu of, and in substitution for, any such other payment. The award does not apply to workmen paid a wage or salary not dependent on time worked or an upstanding wage or salary which covers overtime or other allowances. The award shall take effect from the beginning of the first full pay after Oct. 2, 1918.

GAS IN RELATION TO FUEL ECONOMY.

At the Ninth Annual Congress of the Textile Institute, held at Bradford, under the presidency of Sir Frank Warner, of London, Prof. G. F. Charnock, of the Fuel and Metallurgical Department of the Bradford Technical College, gave a lecture on "Economic Power Production."

After referring to the urgent need for economy in power production as a matter of sound finance in business, irrespective of the national wartime need of the present moment, the lecturer spoke of the huge wastage of heat value in practically all types of engines in the course of the process of converting heat into work. He mentioned that, in all the talk of electrification, it should never be forgotten that electrical transmission did not in any sense get rid of the engine, which would remain as wasteful as before. The internal combustion or gas engine possessed the advantage that the heat rejected in the exhaust was more readily recoverable than in the steam-engine. A highly efficient gas-engine would convert about one-third of the total energy of the gas into useful work—one-quarter being lost in the cylinder jacket and about three-eighths in the exhaust. A thoroughly practical solution of the problem was afforded by the utilization of the exhaust gases from a gas or oil engine for raising steam in a special type of boiler. Such boilers had been installed in large numbers in combination with gas-engines where steam was required for heating or manufacturing purposes, enabling a substantial saving to be effected.

After speaking of the sources of wastage and total loss of heat value in steam power, the lecturer said progress in fuel economy involves something more than increased thermal efficiency of the engine. The recovery of bye-products, which could only be economically effected in very large plants, had been much neglected in this country. Apart from industry, better methods of heating generally were greatly needed; and the abolition of the smoke nuisance demanded urgent attention. It should always be borne in mind that the main object was the utilization of the nation's fuel supplies to the best all-round advantage. Not only should a supreme effort be made by industrial firms to reduce their losses in every possible way, but steps should be taken to set on foot any inquiry or research which would help forward the movement to promote economy in the production of power.

At another stage of the congress, Mr. J. W. Sanderson, M.A., Head Master of the Oundle School, in an address on "Science and Educational Reconstruction," strongly advocated the installation in every big school—public or elementary—of complete model laboratories and workshops in chemistry, mechanics, science, &c., in order to familiarize the students with the industries to which they intended to go, and fit them to be able to handle the work and deal with workmen with a knowledge and sympathy which would avoid industrial strife. Boys, he said, could quite easily make a plant for the extraction of tar and bye-products from coal. They could readily analyze the various alloys, and could do a host of things which would be of mutual advantage to themselves and to the community, because much of their work should be actual practical operation for results.

FUEL ECONOMY IN THE HOME.

The Rationing Scheme.

The first of a series of three public lectures on the "Principles of Fuel Economy in the Home" was delivered last Wednesday evening in the Physiology Theatre at University College, Gower Street, W.C., by Mr. A. H. Barker, B.Sc., B.A., Wh.Sc., Lecturer in Heating and Ventilating Engineering.

Explaining first the nature of heat, and the amount of it in coal, coke, gas, and electricity, the lecturer went on to deal with the fuel ration and its meaning. The fuel equivalents named in the Order were determined by the Coal Controller, not in relation to their value to the consumer, but in relation to the amount of coal which is destroyed. In his opinion, however, the Controller was too generous in allowing so much as 800 units of electricity for a ton of coal. This

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figure was based on the idea that at the electricity works 2½ lbs. of coal has to be burnt to produce a unit of electricity; but this result is attained only in a few of the best plants. In ordinary works, the figure is nearer 3 lbs.

Coming to the lighting allowance, the first question that arose was whether this should be taken out as gas or electricity. The relative allowances for lighting were determined by the Controller so that approximately the same amount of light could be produced by the gas allowance for lighting as by the electricity allowance. The representatives of the gas and electrical interests were called into consultation with the Controller—he (Mr. Barker) had the honour to be one of their number, as a sort of independent and disinterested party—and the question was discussed on this basis. It was laid down as one of the fixed terms of reference that there was to be a special and separate allowance for lighting. The question was simply one of how much light could be produced by so many cubic feet of gas or units of electricity. In his view, it was an extremely unwise decision, and exhibited regrettable confusion of thought and want of fixity of purpose. To fuddle-up the Order in this way, by making two separate and different bases of calculation, had rendered the whole Order incomprehensible to all but a few educated persons, and would cause endless trouble and confusion. The basis of calculation was that a unit of electricity would produce as much light as 62 c.ft. of gas; but the householder should consider which allowance was more useful to him. Of 100 units of heat energy supplied as electricity, a greater proportion is converted into light than with 100 heat units supplied as gas. Thus it happens that the lighting equivalents of gas and electricity are such that the amount of gas for a certain amount of light contains about ten times as much heat as the electricity supplied for the same amount of light. Hence the heat equivalent of the gas is greater than the heat equivalent of the electricity allowed, and is in so far more valuable to the consumer. Therefore, said Mr. Barker, "there is no question that if you use gas at all—for lighting, cooking, water-heating, or room warming, it is to your advantage always to take out your lighting allowance as gas, rather than as electricity, because, whatever the size of your house, the lighting allowance is by far the better value in heat units." Any electricity required should be taken out of the total fuel allowance.

Discussing how the fuel allowance should be taken out, Mr. Barker remarked that they should remember that whatever they took out in fuel as either gas or electricity, they lost heavily in doing it, even allowing for the much smaller proportional loss than with solid fuel. He quoted some general figures to illustrate this point; but at the same time he admitted that there was the question of superior convenience to take into account. Of the coke generally that is bought at the present day, the lecturer had some rather unkind things to say; but he told his audience that where it is of moderately good quality, it is a very good thing to take as much of the ration in coke as can possibly be used. Good coke is very useful, as well as cheap, both for open fires and for range work.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Oct.* 14.

The London tar products market is quite firm. Shipments of pitch are being steadily maintained; while the minimum price of makers' supplies appears to be 65s. net per ton. Benzene, toluene, and creosote are all being absorbed as manufactured, at controlled prices. It is expected that makers of carbolic crystals will arrange a price with crude carbolic producers for the current production. In the meantime, the ideas of value are not definite, although materially higher than for July-September. Solvent naphtha is worth about 3s. 9d. per gallon net and naked.

The position of sulphate of ammonia is unaltered.

Tar Products in the Provinces.

Oct. 14.

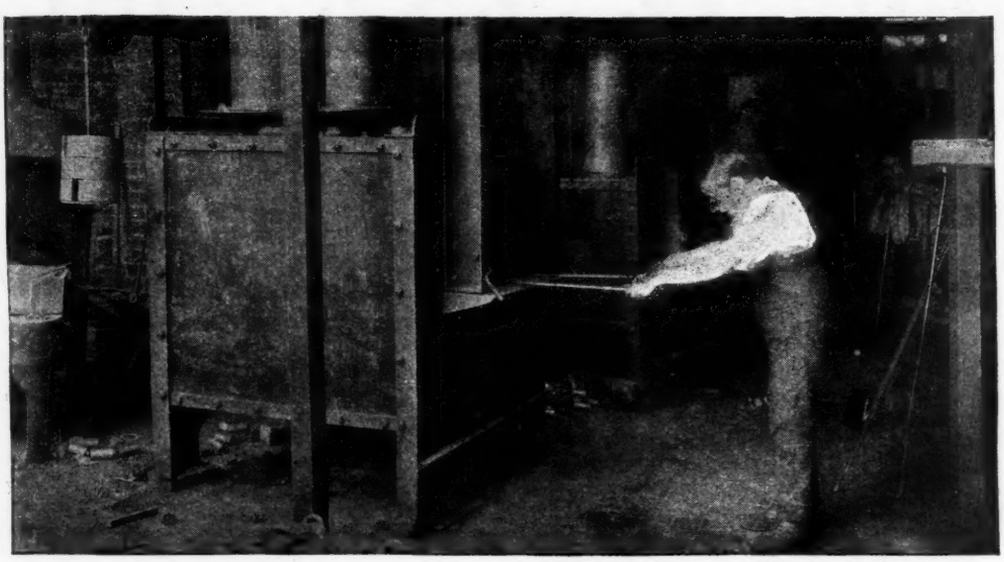
The average values for gas-works products during the week were: Gas-works coal tar, 30s. 6d. to 35s. 6d. Pitch, East Coast, 44s. to 45s. per ton; West Coast—Manchester 34s. to 36s., Liverpool 34s. to 36s., Clyde 34s. to 36s. nominal. Benzol 90 p.ct., North, 10d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha in bulk, North, 7¾d. to 8¼d. Solvent naphtha, naked, North, 2s. 11d. to 3s. Heavy naphtha, North, 2s. 11d. to 3s. Creosote, in bulk, North, 4¼d. Heavy oils, in bulk, North, 4¼d. to 5d. Carbolic acid, 60 p.ct. East and West Coasts, 3s. 3d. naked, nominal. Naphthalene, £25 to £30; salts, £6 to £7, bags included. Anthracene, "A" quality, 4d. to 6d. per unit; "B" quality, 1½d. to 2d.

FROM A MARKET CORRESPONDENT.

Tar Products.

Quietness and a rather smaller volume of business have been the characteristics of the tar product markets during the last few days; but, generally speaking, quotations remain very firm. The peace feelers, and the consequent rapid change in opinion with regard to the duration of the war, have introduced some amount of uncertainty. It may be that the wish is father to the thought; but there are undoubtedly a number of shrewd business men who think it likely that actual hostilities will soon cease, and views of this kind make it necessary to consider the probable course of prices should Germany decide to accept the Allies' terms for an armistice. So far as pitch is concerned, it may be recalled that war conditions have never stimulated the price, but produced quite an opposite effect. Consequently, the proximity of peace could hardly be taken as a "bear" point for this product. Pitch, accordingly, is very strong, in spite of the fact

Gas in War Time Industries



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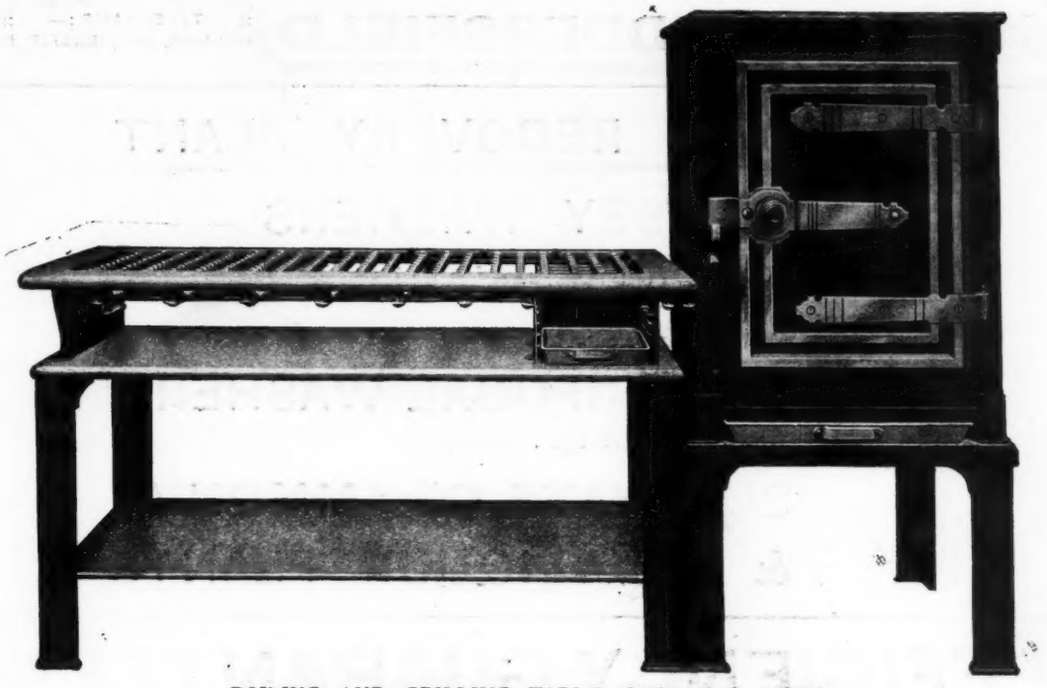

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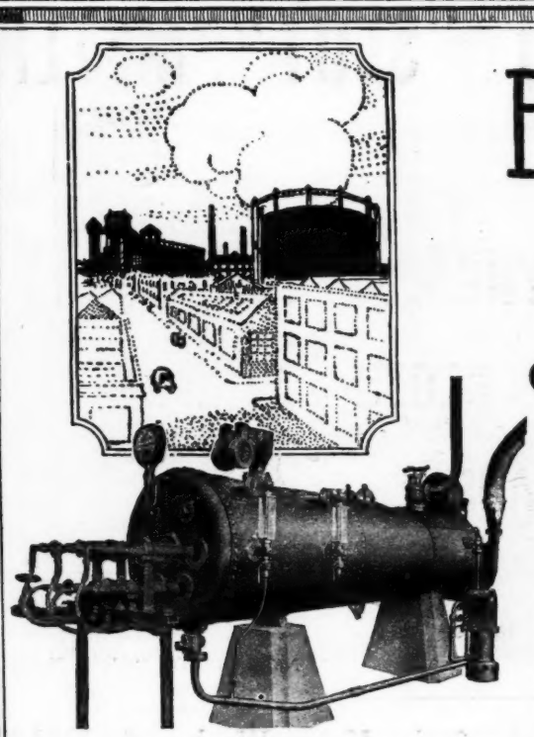

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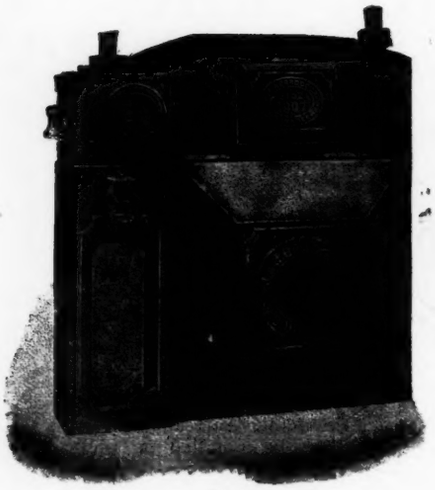

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that the demand for briquette making is adversely affected by the shortage of coal. London quotes 65s. f.o.b.; while in the Provinces makers show no anxiety to accept low quotations. In Manchester, the idea of value for ordinary trading is over 40s. per ton, and there is some belief that prices will rise still further. It appears that the Government have now fixed the price to be paid for the pitch which is required to make what may be termed the creosote and heavy oil group of fuel, at 40s. per ton at the works. Fuel oils remain in urgent request. Although tar-purchase proposals were explained and discussed at a fairly representative meeting in London recently, there are many points of considerable and continued controversy; and it is not yet permissible to publish the scheme in full. Among the various proposals one notes that the distillers desire to tie-up producers for ten years, and to keep the dehydration of tar for their own works. To these propositions many of the responsible undertakings could hardly assent, nor would it be in their own, or the general, interest to do so. Very little business is passing in naphthalene of refined sorts; but the advent of winter is producing a good demand for those qualities of crude which are used in the fire-lighter trade; and quotations for these sorts range from £6 15s. to £14 10s. per ton, with an upward tendency. Solvent naphtha is very firm again, making 3s. 6d. per gallon, with 3s. 9d. asked London, naked. Heavy naphtha is steady at late rates. Crude carbolic acid is quoted at 3s.; and there is a fair export demand for crystals at slightly higher rates. Cresylic acid is steady, and aniline oil and anthracene are firm at last week's figures. As regards benzol, toluol, and creosote, conditions do not change. The range of quotations is as follows:

Benzol: 90% London, 1s. 0½d., North 10½d. to 11½d.; 50% North 1s. 4d. to 1s. 5d. naked per gallon.

Carbolic Acid: 60% East and West Coast 3s. per gallon; crystals 40% 1s. 8d. to 2s. per lb.

Crude Tar: London 39s. to 41s.; Midlands 33s. to 35s.; North 32s. to 34s. per ton *ex* works.

Pitch: London 65s. per ton f.o.b. works; East Coast, 36s. 6d. to 37s. 6d.; West Coast, 37s. 6d. to 40s. f.a.s.; Manchester, 39s.; Clyde, 41s.; South Wales, 45s. per ton.

Solvent Naphtha: London 3s. 3d. to 4s.; North and Midlands 3s. to 3s. 6d. per gallon.

Crude Naphtha: Naked 30% 8½d. to 8¾d.; North 6½d. to 6¾d.

Naphthalene: Refined £28 per ton nominal; salts 80s., bags included.

Toluol: Naked, London 2s. 4d.; North 2s. 3d.

Creosote: Nominal, London 4½d.; North 4d. to 4¼d. (Government price, 75s. per ton f.o.b.—equal to 4¾d. per gallon); heavy oil, 4¼d. per gallon in bulk.

Anthracene: "A" quality, 40-45%, 4½d. per unit; "B" quality, 1¾d. to 2¼d.

Cresylic Acid: 95%, 3s. per gallon; 97-99%, 3s. 3d. to 3s. 6d. per gallon, casks included, *ex* works London and f.o.b. other ports.

Grease Oils 18° Tw. (naked) £6 per ton f.o.r. makers' works.

Sulphate of Ammonia.

There is little of fresh interest to report. For home purposes, there is continued heavy inquiry at the fixed rates, and exports have been on a rather more generous scale than earlier in the year.

Gas-Driven Vehicles in Manchester.—It is reported that, notwithstanding that the Government have decided to discontinue for the present the issue of new gas permits, there are about 320 vehicles in Manchester running on coal gas.

Falkirk and Increasing Gas Prices.—Explaining the cause of the increasing price of gas, Mr. Gilchrist, at the Falkirk Town Council said, among other advances, the sum required to meet local taxes on the works had increased by £1000, equivalent to 6¼d. per 1000 c.ft. The Falkirk works were in the unfortunate position of having a high capital account, necessitating a large sum each year being paid to the sinking fund and in interest. In 1913-14, £700 was paid in income-tax; and this year he estimated they would have to pay £3900. He grudged one gas department having to pay a great deal more than others in the country in proportion to the income derived from the sale of gas. So far as Falkirk was concerned, he had no hesitation in saying they were paying a great deal more in income-tax than most Corporation-owned gas-works.

Brixham Gas Company.—At a special meeting of the Company held in London (Mr. W. A. Scott, the Chairman, presiding), a resolution was passed authorizing the Directors to raise £8000 of additional capital under the Act of this year, "by the creation and issue of new ordinary shares or stock or new preference shares or stock of the nominal value of £1, or wholly or partially by one or other of these modes respectively." The Chairman explained that the existing preference shareholders bought their shares under the impression that they were cumulative as to dividend. The Directors were advised that this was not clear according to the Act; and as the Company were requiring additional capital, a Bill was promoted for the purpose of raising this and incidentally definitely declaring that the preference shareholders were entitled to payment of back-dividends. The progress of the Company had been steadily improving since it was taken over. The profits from gas in 1908 were £1702; and they steadily increased until in 1917 they were £2278. Meanwhile, an electricity scheme had been started; so that in 1917 there was a further profit of £266, making a profit for 1917 of £2545. The Company, however, had the misfortune of having an action brought against them for an injunction, by a man who complained of the vibration caused by an engine. This was fought; and costs amounted to about £2500, which was paid out of the ordinary and preference dividends of the Company. The Directors, therefore, secured power to pay to the preference shareholders the amount of the dividends which had not been paid for four half years in all.

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Reduction of Pressure at Glasgow.—Mr. Alexander Wilson, the General Manager of the Glasgow Corporation Gas Department, intimates that, owing to the unsuitability for gas manufacturing purposes of certain classes of coal now being supplied to the department, it is impossible to maintain full supplies of gas to consumers. The pressure of gas will therefore be reduced between the hours of 10.30 p.m. and 5.30 a.m.

Gas Stealing in Belfast.—In the Belfast Custody Court, before Mr. J. Gray (Resident Magistrate), Wm. J. M'Donnell was charged with the larceny of a quantity of gas, the property of the Corporation. Gas Inspector W. H. Rice stated that on entering premises occupied by the accused, he found gas burning by means of a metallic tube connected with a service-pipe. The gas was coming direct from the main without passing through the meter. The accused pleaded guilty, and was sent to prison for a month.

Scarcity of Small Burners.—The Works Committee of the Lewisham Borough Council report that the Borough Surveyor has been in communication with the South Metropolitan and the South Suburban Gas Companies, as to the possibility of substituting smaller gas-burners in the lamps now lighted, with a view to effecting a saving in the gas used. The Companies state that it is practically impossible at the present time to obtain anything approaching the number of burners necessary. The Committee are also informed that the cost of removing the existing burners and substituting smaller ones would be practically prohibitive, even if they were obtainable. Of the burners in use, over 90 p.ct. are No. 2 upright burners, consuming 2¼ c.ft. of gas per hour. No. 1 inverted burners—the smallest suitable—consume 2 c.ft. per hour. The lamps are lighted for about 3500 hours per annum; and the saving in the gas consumed would amount to 1750 c.ft. per burner. At the present time there are 1512 lamps lighted out of a total of 3202.

Gas Lighting in Calcutta.—The Calcutta Municipal Corporation have been considering whether to light new roads by electricity or gas, and have come to the conclusion that at the present rates gas will be cheaper, and therefore in the best interests of the Corporation. This decision was carried out after the Lighting Superintendent had reported that the Electric Supply Corporation could not make a firm offer for lighting the whole area comprised in the scheme, owing to the difficulties in obtaining the necessary stores. They have, however, made an offer for erecting an overhead service free of cost in one road. The Corporation are interested in the maintenance cost, which works out at Rs. 68 per lamp per annum. This is 28 p.ct. more than the present cost for 100-candle power electric lamps, and is due to enhanced prices owing to the war. The cost of the gas consumption and the maintenance of the street gas-lamps is Rs. 50 per lamp per annum; and the Lighting Department hold big stocks of mantles and fittings, a large proportion of which was bought at low rates prior to, and just after, the commencement of war. It is therefore possible to maintain gas-lamps at a cheaper rate than electric lamps.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for Oct. 9.]

Nos. 15,834—16,226.

Brown, C.—"Cocks, taps, &c." No. 15,847.
Brown and Barlow.—See Brown. No. 15,847.
Bury, A. F. & E.—"Recovery of gaseous products from plants for destructive distillation of organic materials." No. 16,121.
Chinnery, E. J.—"Gas-lighters, &c." No. 15,935.
Crossley, R.—"Pumps, compressors, &c." No. 15,887.
Fountayne Lamp and Engineering Company.—"Acetylene-gas generators." No. 16,080.
Gibbons, J. H.—See Fountayne. No. 16,080.
Grant, P.—"Gas-lighter." No. 15,913.
Hamer, J. D.—"Intensive fractionation of volatile liquids." No. 15,999.
Helmes, M. J.—"Apparatus for treating oils." No. 16,170.
Helps, G.—"Gas stoves, burners, &c." No. 16,212.
Mordecai, W. E.—See Hamer. No. 15,999.
Ollander, O.—See Bury. No. 16,121.
Paine, H.—"Gas-globe gallery for inverted burners." No. 16,049.
Pearse, H.—"Liquid-fuel burners." No. 16,151.
Poore, P.—"Destructive distillation of wood, &c." No. 15,933.
Poore, P.—"Apparatus for destructive distillation of carbonaceous substances." No. 15,938.
Poore, P.—"Destructive distillation of wood, woody fibre, &c." No. 15,939.
Smith, D. J.—"Gas-producers for propelling vehicles." No. 15,900.

Appealing for Economy at Hull.—Making a public appeal for rigid economy in fuel and lighting, the Lord Mayor of Hull spoke of the serious shortage of coal locally. He quoted figures to show that the East Hull Gas Company had only a fortnight's supply in hand. During the week ended Oct. 4, he stated, the Company had received 282 tons of coal and used 422 tons in the manufacture of gas—leaving them with a stock in hand of only 730 tons, as against a reserve supply of 4206 tons for the corresponding week of last year. In the week referred to, they made 5,896,000 c.ft. of gas, as compared with 7,145,000 c.ft. a year ago. If this went on, there would be a lighting famine in East Hull. The Corporation electricity works received 972 tons of coal during the week ended Sept. 27, as against 1031 tons in the corresponding week of 1917; and the stock in hand was 1884 tons, against 2692 tons. When they came to the British Gas Company, the figures were still more striking. The Company received in the week ended Oct. 5 1409 tons of coal, and had 9691 tons in stock. A year ago, they received 500 tons more, and had 20,238 tons in stock. The manufacture of gas was reduced from 24,514,000 c.ft. to 12,693,000 c.ft.

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Australasian Agents: MOLDEN & BUDDEN PTY., Ltd., 364A, Little Collins Street, Melbourne, Vic.; and at SYDNEY, N.S.W.

Coke-Oven Industry of the United States.—The preliminary Government estimate places the total coke production of America for 1917 at 56,000,000 tons, the largest in the history of the industry. Of this total 60 p.ct. was beehive coke, and 40 p.ct. bye-product coke. This ratio, however, is likely to be reversed before long; for the bye-product plants now under construction will have a capacity of 13,800,000 tons.

Lighting of Dungarvan.—At a meeting of Dungarvan Urban Council, a letter was read from Messrs. Anderson Bros., regarding the public lighting contract, in which they stated that they were open to consider any counter offer that might be made to them, the Council having suggested that their own figure was too high; but they reminded the Council that consideration should be given to the enormous increase in cost of production. The Clerk said he had ascertained that the cost of public lighting in New Ross was 7s. 11d. per 1000 c.ft.; in Youghal, 6s. 8d.; in Tipperary, £2 11s. per lamp; and in Thurles, £2 7s. per lamp. It was decided to intimate to Messrs. Anderson that the Council were prepared to give terms similar to those prevailing in Thurles or any town of like size. It was their opinion that there should be a substantial reduction in the price to private consumers.

Wages at Airdrie.—The Airdrie Gas Committee have considered an application by the stokers, which they ultimately remitted to the Convenor and the Gas Manager (Mr. A. Kellock), with power. An application by the gas-fitters for an increase in their wages was also submitted. The Committee agreed to recommend to the Town Council that the wages of these employees should be increased to 1s. 3d. per hour as from the last pay day.

Equivalent in Gas Per Ton of Coal.—At a gathering of members of the Rotary Club of London, answering a question as to whether the Coal Controller would agree to more than 15,000 c.ft. of gas as the equivalent for a ton of coal, Mr. Goodrich, of the Coal Controller's Department, said it was hoped to increase the equivalent in certain parts of the country where gas-works conditions allowed. The Controller wished a far greater use to be made of gas, and that the demand for anthracite should be stimulated in every way. Bearing upon this announcement, it may be stated that, at a meeting last week of the Middlesbrough Town Council, the Mayor (Mr. Joseph Calvert) intimated that, as the Middlesbrough gas supply was from the bye-product of the iron-works, and did not entail consumption of coal in manufacture, sanction had been granted for householders to consume 30,000 c.ft. of gas in place of a ton of coal, instead of 15,000 c.ft.

STOCK MARKET REPORT.

THINGS on the Stock Exchange last week underwent a rather surprising change; and its why and wherefore is not very clearly to be discerned. With our progress in the war going daily from good to better, and the enemy's desperate plight going concurrently worse, one would have looked for marked buoyancy. But, somehow or other, markets contracted a chill, and pretty well all were quite dull and drooping. The demands of "Gun Week" swallowed up a lot of money; and this had something to do with it, perhaps.

In the gilt-edged market, Government issues were hard hit, and Consols, which on the previous Friday had marked 63¼, were done this Friday at 60. But the 5 p.ct. Loan was fairly steady, and the same may be said of Home Rails.

In the Foreign Market, French recovered after some reaction, Belgians were naturally better, and there was some inquiry for Russians.

Business in the Gas Market showed a considerable increase in activity, far beyond the run of recent weeks; and the tone was bright and buoyant. Prices, as if in emulation of the Allied armies, made a general advance all along the line, and more than thirty quotations of all classes—Metropolitan, Suburban, Provincial, Continental, and Universal—enjoyed promotion. Among these, most conspicuous was Gas Light and Coke, with a rise of 5 points on the ordinary stock. The only exception was Imperial Continental, which—as might perhaps be expected—underwent some reaction from a free advance, and shed 2 points from its previous quotations.

Bargains done for cash during the week were as follows: On Monday, Brentford "A" 73¾, ditto "B" 66, British 30⅞, Continental Union 48, Gas Light ordinary 64½, 65, 65½, 66, 66½, ditto debenture 55½, 55¼, Imperial Continental 123, 125, Primitiva 40s. 7½d., 41s., ditto debenture 76, South Metropolitan 65¼, 66, 66¼, 66½. On Tuesday, Brentford "A" 74½, ditto "B" 66½, 66⅔, ditto preference 79, Cape Town 3⅞, ditto preference 7½, ditto debenture 62, Gas Light ordinary 65⅝, 66½, ditto preference 68, ditto debenture 55, 56, Imperial Continental 120, 123, 123⅜, 124, 124¼, Primitiva 40s., 41s., 41s. 3d., ditto preference 60s., 61s., South Metropolitan 66½, 67, 68, Tottenham "B" 66. On Wednesday, Gas Light ordinary 66, 66⅜, 66½, 67, 67½, Imperial Continental 120, 120½, 121, 121¼, 122, 122⅛, 123, Monte Video 9 5/16, Primitiva 40s., ditto preference 62s. 6d., ditto debenture (1911) 50½, 50⅝, River Plate 57, 57½. On Thursday, Cape Town debenture 61, European 12, Gas Light ordinary 66½, 66⅝, 67¼, 67½, 68, 68¼, 68⅜, ditto preference 68½, ditto debenture 55½, Imperial Continental 121, 121½, 122, 122½, 123, Newcastle 68, Primitiva 41s. 3d., 41s. 6d., 41s. 9d., 42s., ditto preference 62s. 6d., South Metropolitan 67½, 68½, 69, 70, ditto debenture 55, South Suburban 70, 71, Barnet "C" 135, 136. On Friday, Brentford "B" 67½, Cape Town debenture 62½, Commercial 3½ p.ct. 57, 57¾, 58½, Gas Light ordinary 68¼, 68⅜, 68½, 68⅝, 68¾, 68⅞, 69, 69½, 70, ditto maximum 54, ditto debenture 55, 55¼, 55½, Imperial Continental 120, 120½, 121¼, 121½, 121¾, Primitiva 42s., 42s. 6d., South African 12, 12½, South Metropolitan 70½, 71.

The Money Market was easy. The Bank rate is 5 p.ct., as fixed on April 5, 1917.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue £	Shares	When ex-Dividend.	Ante-War Interest & Dividend p.c.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
182,049	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	55—60	..
1,551,868	,,	April 8	2½	4⅜	Alliance & Dublin Ord.	59—64	51—56	..
874,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	62—67	..
280,000	5	April 29	7½	8%	Bombay, Ltd.	5½—6¾	4¾—5½*	..
50,000	10	Feb. 26	16	11%	Bournemouth Gas and Water { 10 p.c.	28—30	20—22	..
383,110	10	,,	7	7%	{ B 7 p.c.	15—15½	10—11	..
115,000	10	,,	6	6%	{ Pref. 6 p.c.	13½—14	9—9½	..
159,740	—	—	—	4%	{ 4 p.c. Deb.	..	66—68	..
992,045	Stk.	Feb. 26	14	4½%	Brentford A Consolid.	261—266	74—77	73¾—74½
784,920	,,	,,	11	4½%	Do. B New	204—209	66—69	66—67½
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	77—82	79
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—98	52—64	..
217,380	,,	Feb. 26	11	8½%	Brighton & Hove Orig.	208—213	133—138	..
244,200	,,	,,	8	5½%	Do. A Ord. Stk.	154—159	93—98	..
530,000	20	Mar. 26	12½	22/6	British	44—45	30½—31½	30⅞
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	64—66	..
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	50—58	..
100,000	10	—	—	—	CapeTown & Dis., Ltd.	1½—2½	3½—4½	3⅞
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	7½—8½	7⅝
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—66	61—62
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	79—81	..
1,518,280	,,	Feb. 12	5/9/4	86/-	Commercial 4 p.c. Stk.	106—108	58—63	..
580,000	,,	,,	5½	80/-	Do. 3½ p.c. do.	103—105	55—60	57—58½
475,000	,,	June 11	8	8%	Do. 3 p.c. Deb. Stk.	69½—71½	52—54	..
800,000	,,	,,	4	—	Continental Union Ltd.	*76—79	47—52	48
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	67—72	..
278,400	—	—	—	10½%	Croydon B and C 7 p.c.	..	140—150	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	6⅔%	Derby Con. Stk.	123—125	95—100	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,002,180	10	July 29	10	5/6	European, Ltd.	17½—18	13—13	12
16,298,975	Stk.	Feb. 10	4/17/4	29/4	Gas Light and Coke { 4 p.c. Ord.	98—102	68—70	64½—70
2,600,000	,,	,,	8½	8½%	{ 3½ p.c. max.	76—79	54—56	54
4,062,235	,,	,,	4	4%	{ 4 p.c. Con. Pref.	96—99	67—69	68—68½
4,674,850	,,	June 11	8	8%	{ 3 p.c. Con. Deb.	72½—74½	54—56	55—56
130,000	,,	,,	10	10%	10 p.c. Bonds	..	..	..
268,740	,,	Mar. 12	5	23⅓%	Hastings & St. L. 3½ p.c.	87—89	45—50	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16⅝	7—8	..
86,600	—	—	—	9½%	Hornsey 7 p.c.	..	112—117	..
181,000	Stk.	Mar. 12	7½	6⅔%	Ilford A and C.	151—154	90—95	..
65,750	,,	,,	6½	4⅔%	Do. B	115—118	69—74	..
65,500	,,	June 26	4	4%	Do. 4 p.c. Deb.	92—94	62—65	..
4,940,000	,,	May 14	9	4½%	Imperial Continental	150—160	120—125	120—123
1,235,000	,,	Feb. 12	8½	8½%	Do. 5½ p.c. Deb. Red.	84—86	70—72	..
235,242	,,	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	92—97	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A	211—213	82—84	..
					{ B	146—148		
806,088	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	71—78	..
75,000	5	June 11	6	8%	Malta & Mediterranean	4½—4⅝	8½—8½	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	87—98	..
541,980	20	May 26	4	6⅔	Monte Video, Ltd.	11½—12	8½—9½	9⅜
1,875,892	Stk.	July 29	4½	8½%	Newcastle&Gatsh'dCon.	98½—99½	67—69	68
529,795	,,	June 26	8½	8½%	Do. 3½ p.c. Deb.	82—83	59—61	..
55,940	10	Feb. 26	7/14/0	7½	North Middlesex 7 p.c.	14—15	9½—10½	..
800,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	102—104	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7¾	4—5	..
60,000	50	Feb. 26	13	9%	Porisea, Island B	128—131	78—83	..
100,000	50	,,	12	8%	Do. C	118—121	78—78	..
52,000	50	,,	10	6%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5¼—6	2 2½	40/—42.6
499,960	5	June 26	5	2.6	Do. 5 p.c. Pref.	4¾—5	3—3½	60/—62/6
531,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—98	75—77	76
—	—	—	—	6%	Do. ,, 1911	..	50—55	50½—50⅞
846,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	55—60	57—57½
150,000	10	May 14	6	6/	San Paulo { 6 p.c. Pref.	10½—11	7½—7¾	..
125,000	50	July 1	5	5%	{ 5 p.c. Deb.	47—49	40—42	..
185,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	..	..
209,984	,,	,,	10	10%	Do. B	223—224	168—172	..
523,500	,,	,,	10	10%	Do. C	220—222	..	..
90,000	10	May 28	9	6/-	South African	10½—11½	11½—12½*	12—12½
6,609,895	Stk.	Feb. 10	5/4/0	32/-	South Met. 4 p.c. Ord.	111—113	69—71	66½—71
250,000	,,	July 12	—	5%	Do. Pref.	..	91—93	..
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb.	72½—74½	54—56	55
234,820	,,	Feb. 26	6½	6%	South Shields Con. Stk.	157—159	118—119	..
952,795	,,	,,	6	8½%	S'th Suburb'n Ord. 5 p.c.	114—116	70—72	70—71
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110—112	73—75	..
135,000	—	—	—	3½%	Do. West Kent	..	..	..
167,553	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	83—85	..
647,740	,,	May 14	5	8%	Southampton Ord.	99—102	68—71	..
120,000	,,	Feb. 12	7½	6½%	Tottenham { A 5 p.c.	135—138	90—95	..
782,275	,,	,,	6	4%	District { B 3½ p.c.	115—117	66—68	66
181,255	,,	June 26	4	4%	{ 4 p.c. Deb.	87—89	61—63	..
182,880	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	103½—109½	87—88	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	,,	Feb. 26	8⅜	63/9	Wandsworth A 5 p.c.	151—156	99—105	..
265,636	,,	,,	6¼	48/9	Do. B 3½ p.c.	129—134	70—75	..
109,075	,,	,,	5/17/3	44/7½	Do. C 3½ p.c.	110—115	70—75	..
852,000	,,	,,	6¼	42/6	Wimbledon 5 p.c.	117—122	70—75	..
98,000	,,	,,	6⅜	48/9	Epsom 5 p.c.	121—126	70—75	..
88,416	,,	June 26	8	8%	3 p.c. Deb. Stk.	66—69	49—52	..

* Ex Div.

The Keighley Town Council last week considered a proposition to hold the meetings in the afternoon, instead of the evening, so as to economize fuel and lighting; but the proposition was defeated on a vote.

The York City Engineer has obtained information from twenty towns in the North-Eastern Counties, and finds that in some cases lighting is suspended. In others the number of lamps has been considerably reduced, and generally these are extinguished before midnight.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

Assistant Engineer and Manager. Macclesfield Gas Department. Applications by Oct. 28.
Assistant Chemist. Barnet Gas and Water Company.
Draughtsman. No. 6515.
Working Manager and Fitter. No. 6513.
Junior Assistant Chemist (in Tar-Works Laboratory). No. 6503.

Appointments, &c., Vacant (*Continued*).

Carbonizing Foreman. Barnet Gas and Water Company.
Engine Fitter. Ilford Gas-Works.
Leading Fitter. Oldham Gas-Works.

Appointments, &c., Wanted.

Lady Show Room Attendant. No. 6510.
Manager or Assistant Manager. No. 6509.
Gas Fitter. No. 6496.

Meeting.

Institution of Gas Engineers. Institution of Civil Engineers. Oct. 17 and 18.

Gas-Works for Sale.

Craven Arms Gas Company. By Auction at the Craven Arms Hotel. Oct. 21.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

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Resists 4500° Fahr. Best for Gas-Works.
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SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated Wm. Pearce & Sons, Ltd.,
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SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
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